

TUBERCULOSIS IN COLORADO

A Summary of Cases Reported in 1998 and 1999

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The number of cases of active tuberculosis (TB) in Colorado has been declining since 1993 when there were 107 cases reported. In 1998, 79 cases of active TB were reported. This was a 15% decrease from 1997 when 94 cases were reported. In 1999, however, there was a 10% increase with 88 cases being reported (**Figure 1**). **Table 1** shows a comparison between 1998 and 1999 cases.

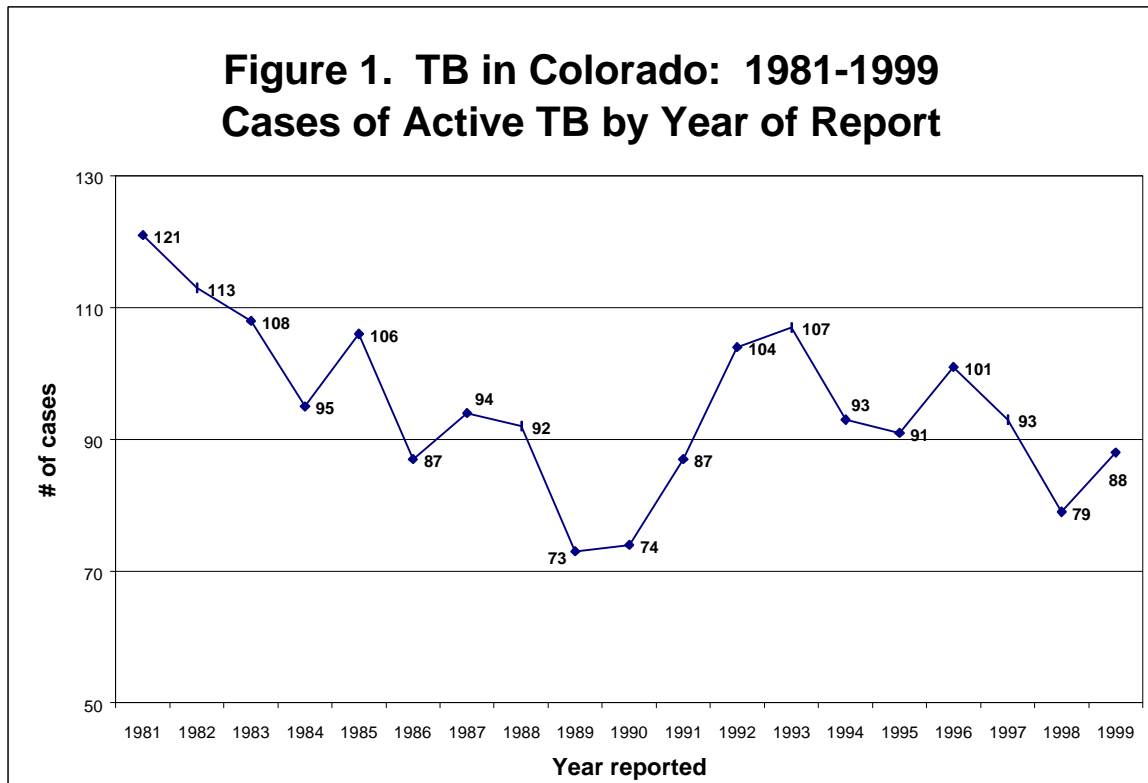


Table 1. TB in Colorado: 1998-1999				
Comparison of 1998 and 1999 Cases				
	Year reported		% change	
	1998	1999		
Age Group				
<15	7	13	46.2	
15-24	3	5	40.0	
25-44	26	26	0.0	
45-64	15	22	31.8	
65+	28	22	(27.3)	
TOTAL	79	88	10.2	
Gender				
Male	52	58	10.3	
Female	27	30	10.0	
TOTAL	79	88	10.2	
Race/Ethnicity				
White	17	26	34.6	
Black	11	13	15.4	
Hispanic	32	29	(10.3)	
Amer Ind/AK native	0	1	100.0	
Asian/Pacific Is	19	19	0.0	
TOTAL	79	88	10.2	
Region				
Denver metro ^a	54	65	16.9	
Other than Denver metro	25	23	(8.7)	
TOTAL	79	88	10.2	
Country of Origin				
United States	39	41	4.9	
Mexico	13	14	7.1	
Vietnam	6	7	14.3	
Other countries	18	26	30.8	
Unknown	3	0	(100.0)	
TOTAL	79	88	10.2	
HIV Status Among 25-44 Age Group				
Negative	19	22	13.6	
Positive	5	2	(150.0)	
Refused testing	1	2	50.0	
Unknown	1	0	(100.0)	
TOTAL	26	26	0.0	
Other				
Homeless within past year	6	11	45.5	
Resident of correctional facility at diagnosis	1	0	(100.0)	
Resident of long-term care facility	2	3	33.3	
Injected drug use within past year	0	1	100.0	
Non-injected drug use within past year	10	5	(100.0)	
Excess alcohol use within past year	14	7	(100.0)	
Health care worker within past 2 years	4	2	(100.0)	

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

Incidence Rate

In 1998 and 1999, the incidence rates for TB were 1.9 per 100,000 and 2.1 per 100,000 respectively (**Figure 2**). Although the overall rates are below the “Healthy People 2000” objective of 3.5 cases per 100,000, the rates in certain groups exceed the “Healthy People 2000” goal. The goal for persons of Asian/Pacific Islander race/ethnicity is 15.0 per 100,000. Colorado’s rate in 1998 was 20.2 per 100,000, and was still higher in 1999 with a rate of 22.1 per 100,000. The rates for persons of Hispanic race/ethnicity were also above the 2000 goal in 1998 and 1999 (**Table 2**). The number of new cases of TB will have to be reduced to reach the “Healthy People 2010” goal of 1.0 case per 100,000.

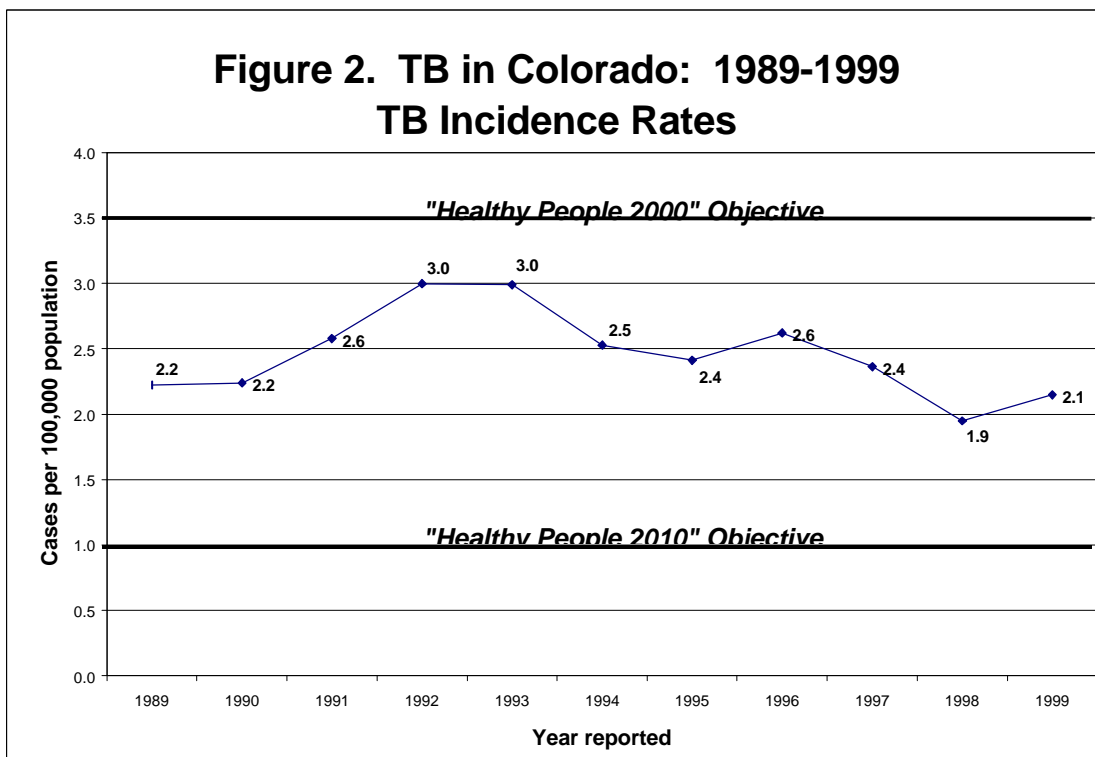
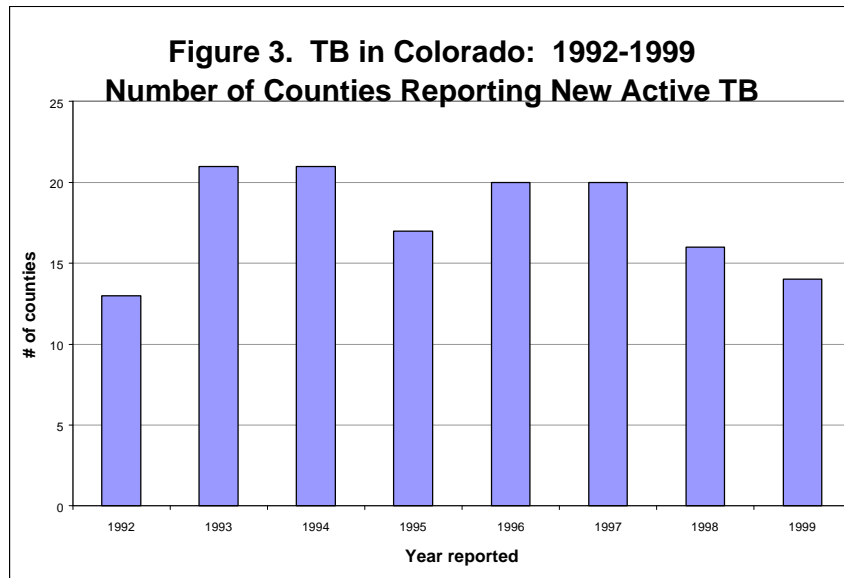


Table 2. TB in Colorado: 1998-1999
Case Rates (per 100,000) by Race/Ethnicity

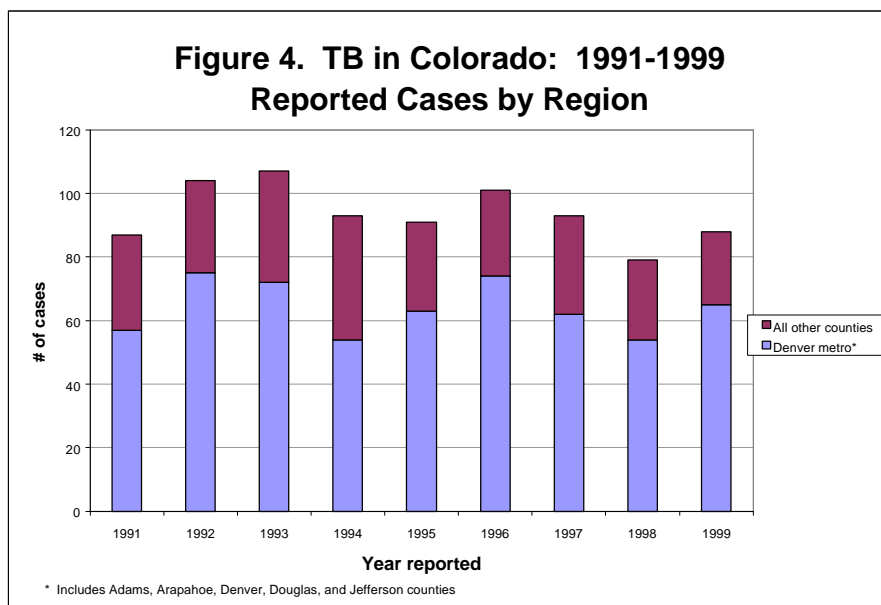
Race/ethnicity	1998			1999			Year 2000 goal
	# cases	Pop est.	Rate	# cases	Pop est.	Rate	
White	17	3,152,135	0.5	26	3,253,568	0.8	3.5
Black	11	171,793	6.4	13	179,730	7.2	10.0
Hispanic	32	542,331	5.9	29	542,026	5.4	5.0
Asian/Pacific Islander	19	93,851	20.2	19	85,792	22.1	15.0
Amer Ind/AK native	0	36,530	0.0	1	41,753	2.4	5.0
TOTAL	79	3,996,640	2.0	88	4,102,869	2.1	<=3.5

Location

In 1998, 16 of 63 (25%) counties reported new active cases of TB, and in 1999 14 (22%) counties reported cases. In 1999, three counties (Moffat, Phillips, Rio Grande) each reported one new case after having been free of TB for at least five years. Conversely, 21 counties that had reported at least one case during the previous five years did not report any new cases in 1999 (**Figure 3, Table 3**).



Approximately half of the state's population resides in the five metro Denver counties of Adams, Arapahoe, Denver, Douglas, and Jefferson. However, two-thirds of all the cases of TB in Colorado are from the metro Denver metro area. In 1999, 65 of the 88 cases were from the Denver metro area (**Figure 4**).



**Table 3. TB in Colorado: 1994-1999
Cases by County and Year of Report**

County	Year reported					5-year mean	1999 cases
	1994	1995	1996	1997	1998		
Adams	4	5	10	10	7	7.2	8
Alamosa	1	0	0	1	0	0.4	0
Arapahoe	7	11	13	10	6	9.4	12
Archuleta	0	0	1	0	0	0.2	0
Bent	0	0	0	0	1	0.2	0
Boulder	5	5	1	6	4	4.2	3
Crowley	0	0	1	0	0	0.2	0
Delta	2	1	1	0	0	0.8	0
Denver	39	45	40	37	34	39.0	39
Douglas	0	0	2	1	1	0.8	1
Eagle	0	1	1	3	0	1.0	0
El Paso	8	3	5	5	4	5.0	9
Fremont	1	1	0	1	1	0.8	0
Garfield	1	0	0	1	1	0.6	0
Gunnison	0	0	0	1	0	0.2	0
Jefferson	4	3	8	4	6	5.0	5
La Plata	0	0	2	0	0	0.4	0
Lake	1	0	1	0	0	0.4	0
Larimer	2	4	0	3	1	2.0	0
Las Animas	0	2	1	2	0	1.0	1
Lincoln	1	0	0	0	1	0.4	0
Mesa	1	1	5	1	2	2.0	0
Moffat	0	0	0	0	0	0.0	1
Montezuma	0	1	0	0	0	0.2	0
Montrose	1	0	1	1	0	0.6	0
Morgan	3	2	1	1	0	1.4	0
Otero	0	0	1	1	2	0.8	1
Park	1	0	0	0	0	0.2	0
Phillips	0	0	0	0	0	0.0	1
Prowers	1	0	0	0	0	0.2	0
Pueblo	3	3	4	1	5	3.2	5
Rio Grande	0	0	0	0	0	0.0	1
Routt	0	0	0	1	0	0.2	0
Washington	1	0	0	0	0	0.2	0
Weld	6	3	2	3	3	3.4	1
TOTAL	93	91	101	94	79	91.6	88

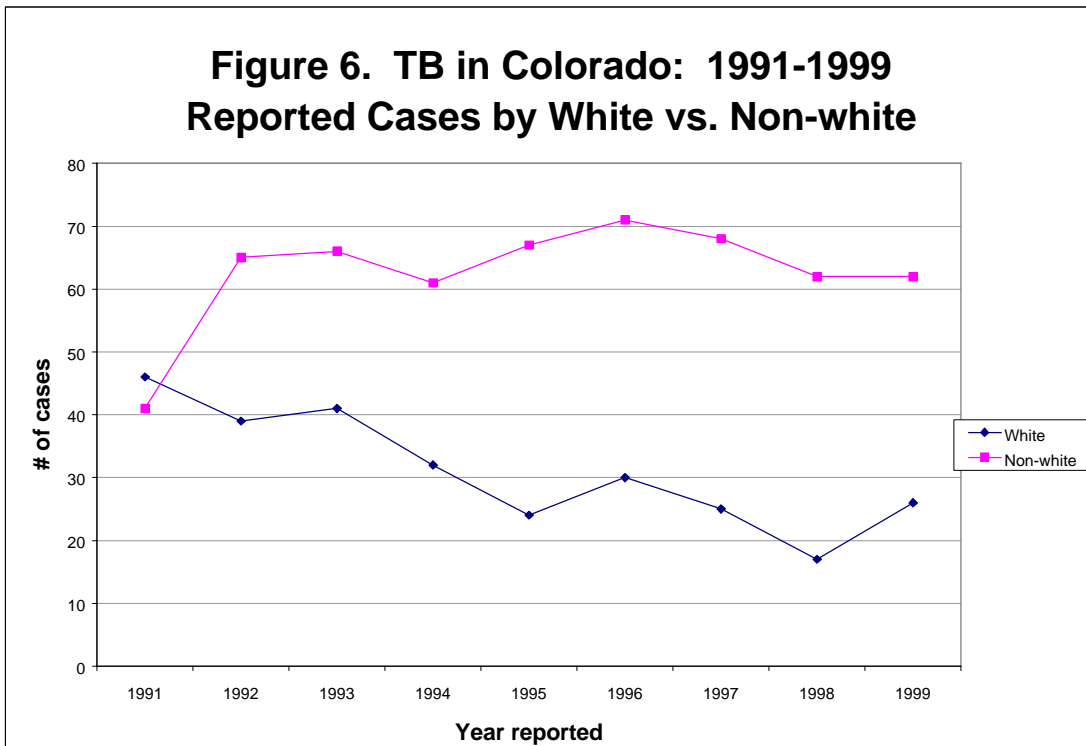
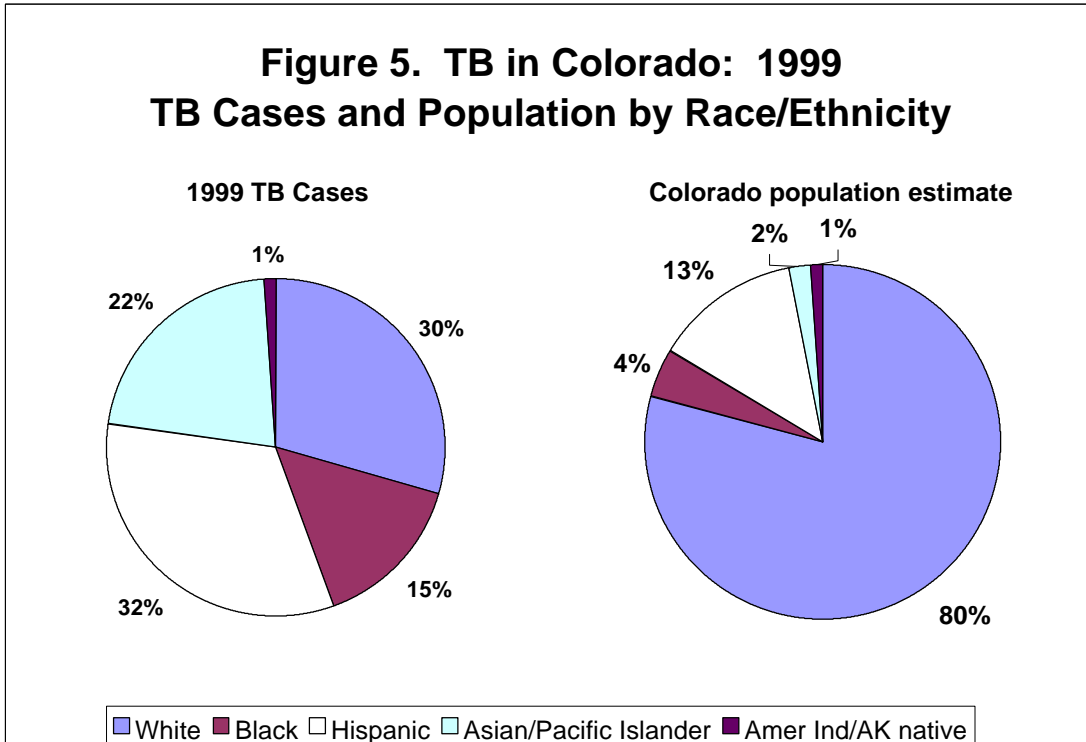
It is statistically tenuous to compare incidence rates between individual counties because the rate in counties with small populations may vary considerably from year to year although the frequency of reports may change by only one or two cases. In order to make a more realistic comparison, the average incidence for counties that reported cases during the past five years is listed in **Table 4**. At 3.3 cases per 100,000 per year, the incidence rate for the metro Denver counties combined was over twice the rate in the rest of the state (1.5 per 100,000 per year).

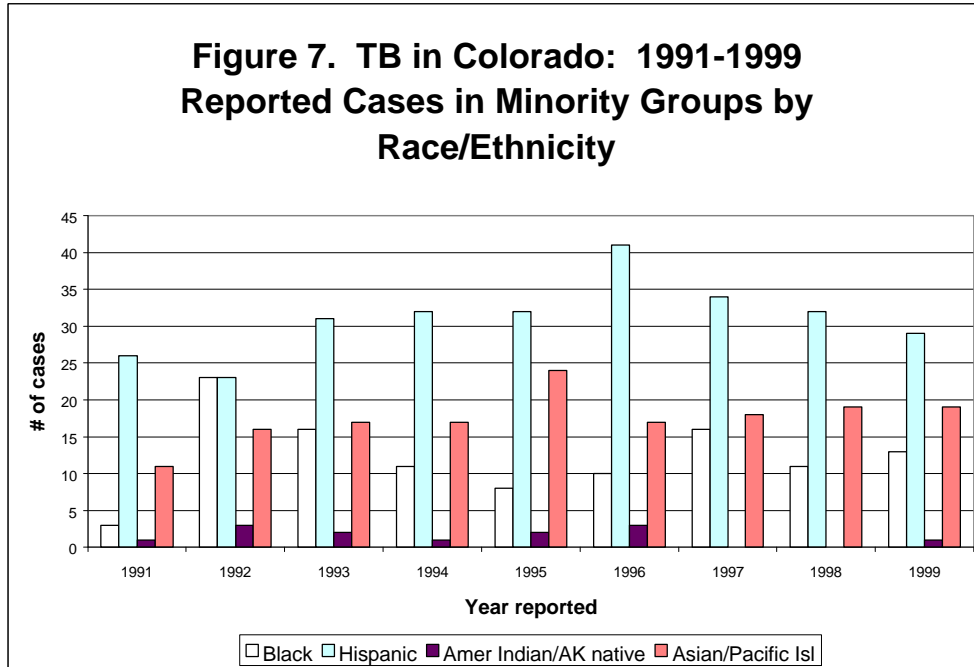
Table 4. TB in Colorado: 1995-1999 Mean Case Rates by County							
County	Mean cases 1995-99	1997 population	Cases per 100,000 persons per year	County	Mean cases 1995-99	1997 population	Cases per 100,000 persons per year
Denver	39.0	504,701	7.7	Moffat	0.2	12,464	1.6
Las Animas	1.2	15,798	7.6	Delta	0.4	25,979	1.5
Otero	1.0	21,455	4.7	Weld	2.4	156,533	1.5
Crowley	0.2	4,519	4.4	Boulder	3.8	264,970	1.4
Phillips	0.2	4,649	4.3	Fremont	0.6	42,375	1.4
Bent	0.2	5,813	3.4	Montrose	0.4	30,996	1.3
Eagle	1.0	32,105	3.1	Alamosa	0.2	15,703	1.3
Lincoln	0.2	6,549	3.1	Routt	0.2	17,346	1.2
Morgan	0.8	26,697	3.0	El Paso	5.2	481,779	1.1
Pueblo	3.6	133,869	2.7	Garfield	0.4	38,250	1.0
Adams	8.0	314,191	2.5	Jefferson	5.2	503,908	1.0
Lake	0.2	8,301	2.4	La Plata	0.4	40,943	1.0
Archuleta	0.2	8,543	2.3	Montezuma	0.2	22,697	0.9
Arapahoe	10.4	464,319	2.2	Douglas	1.0	130,684	0.8
Rio Grande	0.2	12,037	1.7	Larimer	1.6	226,328	0.7
Mesa	1.8	110,665	1.6				
Gunnison	0.2	12,305	1.6	TOTAL	68.4	3,935,289	1.7

Race/Ethnicity

Of the 88 cases reported in 1999, 29 (32%) were Hispanic, 26 (30%) were non-Hispanic white, 19 (22%) were Asian/Pacific Islander, 13 (15%) were black, and 1 (1%) was American Indian/Alaskan native. The rates in 1998 were similar. As compared to Colorado's population, which is approximately 80% non-Hispanic white, minorities are over-represented (**Figure 5**). Since 1991, there has been an overall decrease in cases in white race/ethnicity while cases in non-white

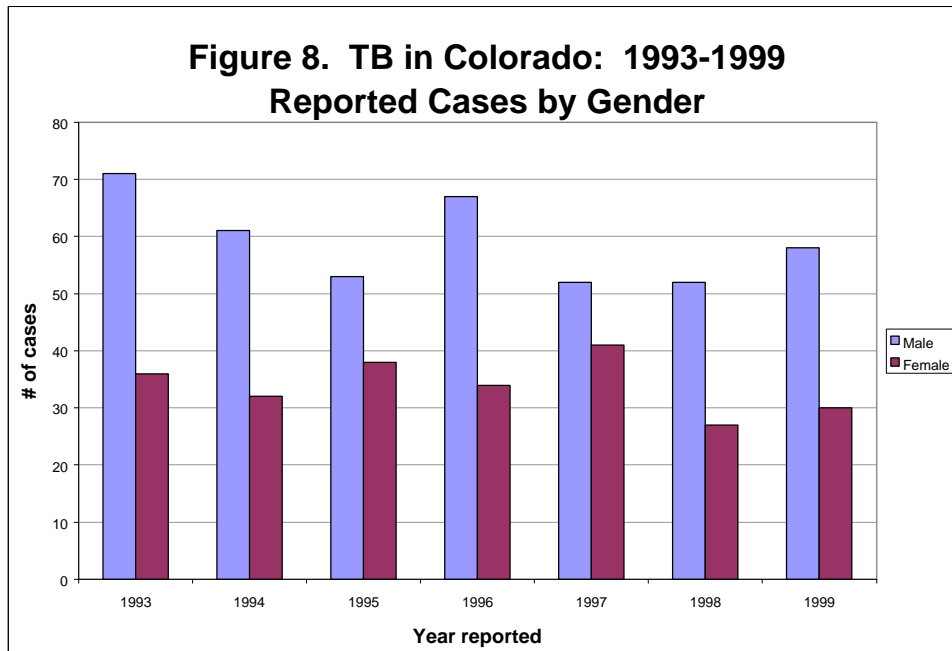
race/ethnicity are increasing (**Figure 6**). The number of cases by minority race/ethnicity since 1991 are shown in **Figure 7**.





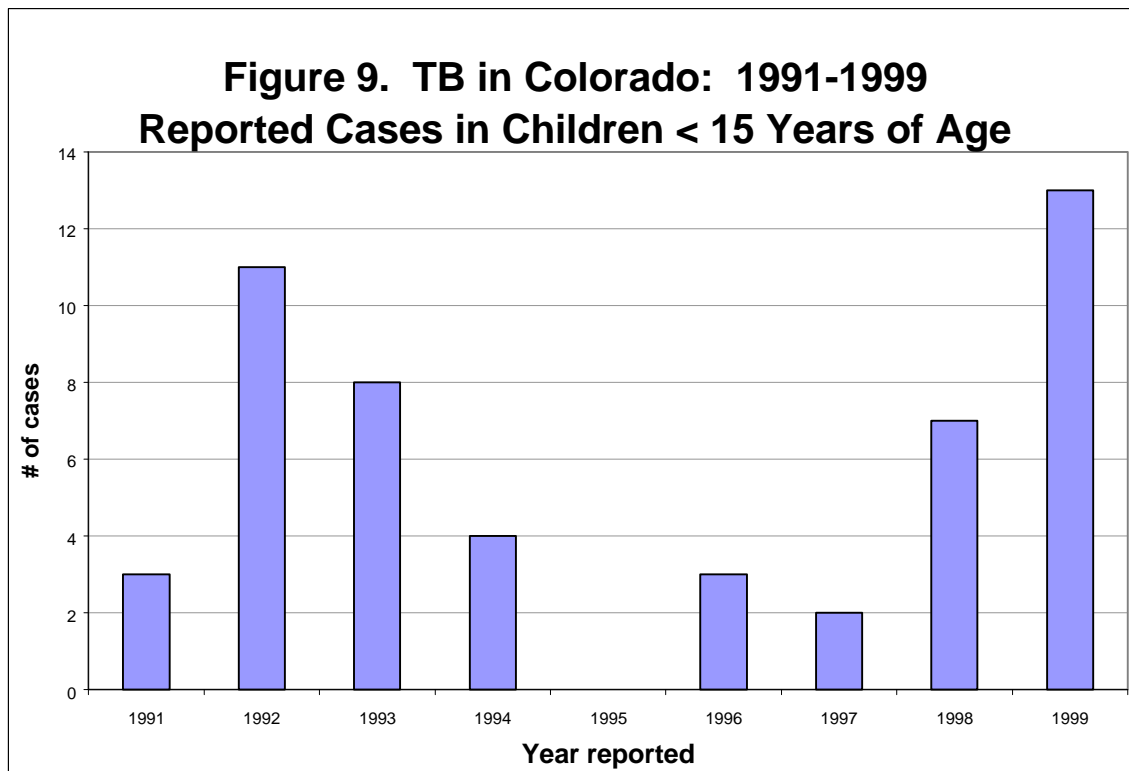
Gender/Age

The number of cases occurring among males is approximately twice that occurring among females (**Figure 8**). The ages of persons reported with TB in 1998 ranged from 1 year to 90 years with the average age being 51 years. In 1999, the ages ranged from <1 year to 94 years, and the average age was 45 years.



In 1998, there were 7 cases reported in children less than 15 years of age, and in 1999 the number of cases increased to 13. Eight of the 20 children were born outside of the United States. The majority of the cases (17) were from metro Denver counties, and 3 were from El Paso county. Cases in this age group are an indicator of recent disease transmission.

The number of cases in children less than 15 years has been increasing since 1995 when no cases were reported (**Figure 9**). The incidence rate for this age group was 0.8 per 100, 000 in 1998 and 1.5 per 100,000 in 1999. Generally, incidence rates increased with age with the highest incidence rates occurring in the 85 years and older age group. The largest number of cases for both 1998 and 1999 was in the 35-44 year age group (**Table 5**).



**Table 5. TB in Colorado: 1998-1999
Cases and Case Rates by Age Group and Gender**

Age group	1998					1999				
	Male	Female	Total	Pop.est.	Rate*	Male	Female	Total	Pop.est.	Rate*
0-14	2	5	7	892,116	0.8	9	4	13	892,288	1.5
15-24	1	2	3	600,510	0.5	2	3	5	608,545	0.8
25-34	8	3	11	571,595	1.9	7	4	11	564,254	1.9
35-44	14	1	15	720,697	2.1	10	5	15	717,209	2.1
45-54	3	2	5	558,170	0.9	10	1	11	580,983	1.9
55-64	6	4	10	313,560	3.2	9	2	11	326,147	3.4
65-74	6	7	13	226,520	5.7	5	6	11	229,092	4.8
75-84	9	1	10	131,036	7.6	4	3	7	137,279	5.1
85+	3	2	5	40,139	12.5	2	2	4	42,518	9.4
TOTAL	52	27	79	4,054,343	1.9	58	30	88	4,098,315	2.1

* Cases per 100,000 persons.

Foreign-born

In 1998, nearly half (47%) of the TB cases were among persons known to have been born outside the United States. In 1999, over half (53%) of the cases were born outside the United States (**Figure 10**). Though most of these cases were born in Mexico, there were cases reported in 1998 and 1999 in persons born in 22 other countries (**Table 6**).

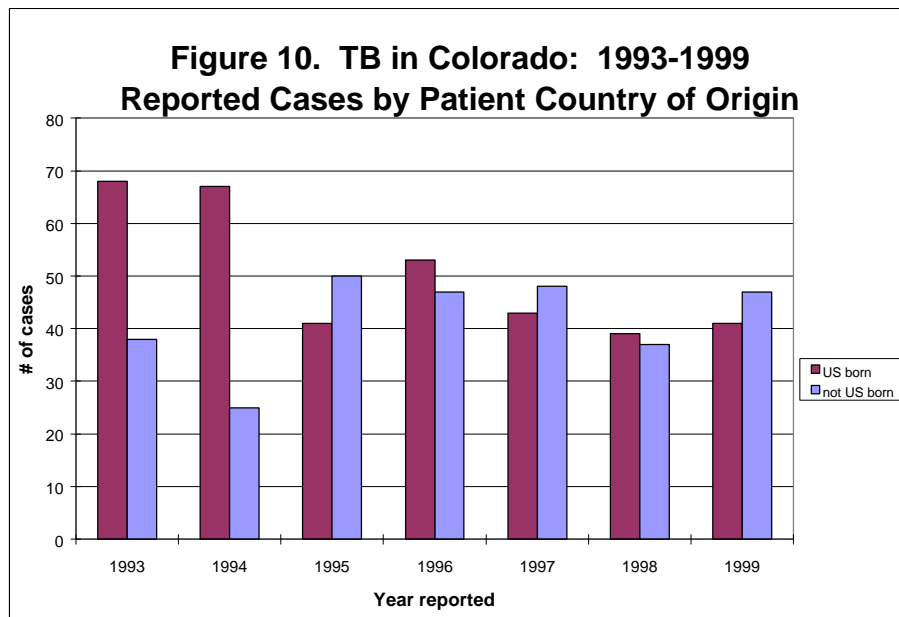


Table 6. TB in Colorado: 1998-1999 Patient Country of Origin					
Country	# of cases		Country	# of cases	
	1998	1999		1998	1999
United States	39	41	Micronesia	1	0
Bosnia	0	1	Pakistan	0	1
Cambodia	0	1	Peru	0	1
China	5	0	Phillipines	4	0
El Salvador	0	2	Romania	0	1
Ethiopia	3	0	Senegal	0	2
Germany	0	1	Somalia	1	3
Honduras	1	0	Sudan	0	1
Hong Kong	1	0	Thailand	1	2
Hungary	1	0	Vietnam	6	7
India	0	7	Zimbabwe	0	1
Korea	0	2	Unknown	3	0
Mexico	13	14	TOTAL	63	69

Although the number of cases are similar in the U.S.-born and foreign-born, there are several differences between the characteristics of the two groups. In 1999:

- The mean age of foreign-born cases was 41 years (40% less than 35 years) and the mean age for U.S.-born cases was 49 years (24% less than 35 years).
- 13% (6/47) of the foreign-born cases were of white race/ethnicity as compared to 49% (20/41) of the U.S.-born cases.
- 15% (7/47) of the foreign-born cases were resistant to one or more primary drug as compared to 5% (2/41) of the U.S.-born cases.

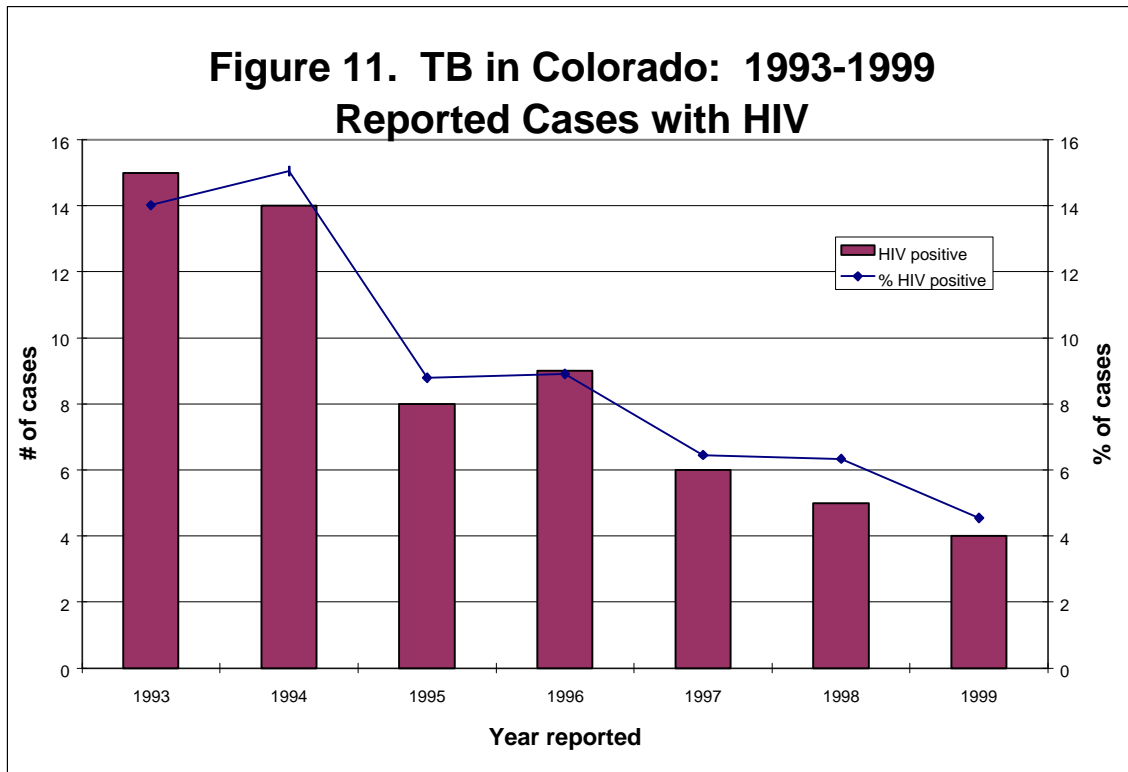
Table 7 shows the number of cases by age group for those born in the United States and those born outside the United States.

Table 7. TB in Colorado: 1998-1999 Reported Cases by Age Group and Patient Country of Origin								
Age Group	1998				1999			
	USA	Foreign	Unknown	Total	USA	Foreign	Unknown	Total
0-4	2	2	0	4	6	3	0	9
5-14	2	1	0	3	2	2	0	4
15-24	1	2	0	3	0	5	0	5
25-34	3	7	1	11	2	9	0	11
35-44	8	7	0	15	5	10	0	15
45-54	2	3	0	5	7	4	0	11
55-64	3	7	0	10	6	5	0	11
65-74	7	5	1	13	7	4	0	11
75-84	7	2	1	10	3	4	0	7
85+	4	1	0	5	3	1	0	4
TOTAL	39	37	3	79	41	47	0	88

Elapsed time since entry into the U.S. was available for all 47 foreign-born cases reported in 1999. Fifteen (32%) were in the U.S. less than one year, 15 (32%) had been in the U.S. 1-5 years, and 17 (36%) had been in the U.S. for over five years.

HIV/TB Co-infection

The number of cases of TB among persons who are at highest risk of developing active disease – those infected with HIV as well as TB – has been declining since 1993. In 1994, 15% of the new active TB cases were HIV-positive. In 1998, 6% of the cases were co-infected with HIV. In 1999, there were only 4 cases (5%) known to be HIV-positive (**Figure 11**).

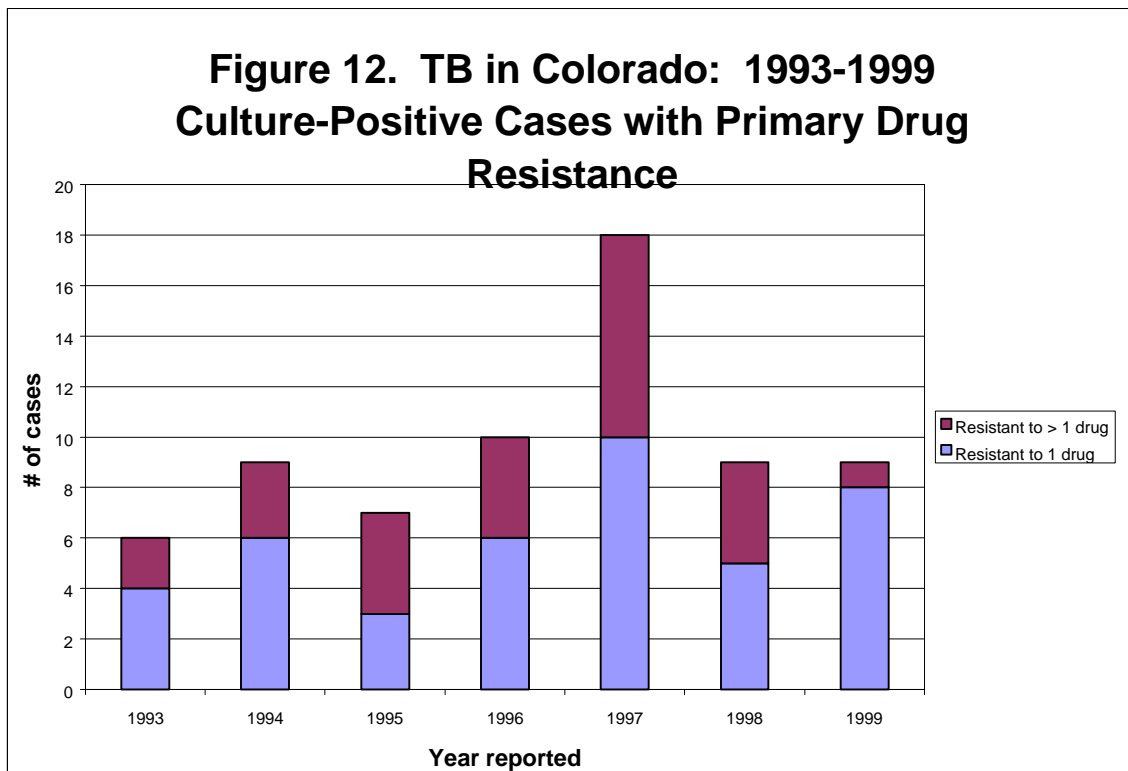


Occupation

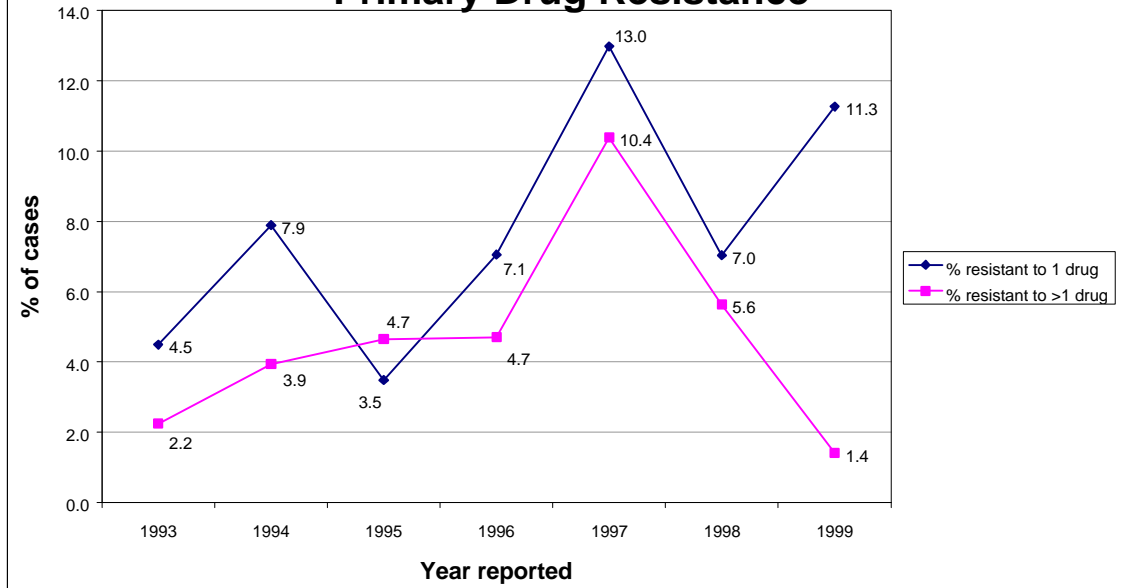
The occupational status is known for 74 (94%) of the cases in 1998 and for all 88 cases in 1999. In 1998, 4 cases were health care workers (currently or within the past two years), 41 were unemployed (including children and retired persons), and 29 worked at a variety of jobs not known to present a high risk for TB. In 1999, 2 cases were health care workers (currently or within the past two years), 55 were unemployed (including children and retired persons), and 31 worked at a variety of jobs not known to present a high risk for TB.

Drug Susceptibilities

Drug susceptibility results were available for all culture-positive TB cases in 1998 and 1999. Nine (13%) of the 71 culture-positive cases in 1998 and 9 (13%) of the 71 culture-positive cases in 1999 were resistant to one or more primary drugs (ethambutol, isoniazid, pyrazinamide, rifampin, streptomycin) (**Figures 12 and 13**).



**Figure 13. TB in Colorado: 1993-1999
Percent of Culture-Positive Cases with
Primary Drug Resistance**



The primary resistance patterns were as follows:

- 7 isoniazid (INH) only
- 5 streptomycin only
- 4 INH and streptomycin
- 1 pyrazinamide only
- 1 INH, streptomycin, and pyrazinamide

A total of 12 isolates were resistant to INH. No isolates were resistant to both INH and rifampin.

As shown in **Table 8**, there have been more cases of drug-resistance among foreign-born than in those born in the United States. In 1998, 16.2% of the foreign-born cases had drug-resistance as compared to 5.1% of the U.S.-born cases. In 1999, 14.9% of the foreign-born cases had drug-resistance as compared to 4.9% of the U.S.-born cases.

Since 1993, 14 counties have reported new, active TB cases that were resistant to one or more drugs (**Table 9**).

Table 8. TB in Colorado: 1993-1999 Origin of Persons With Primary Drug Resistant Organisms				
Year	Country of Origin			Total
	USA	Foreign	Unknown	
1993	2	4	0	6
1994	4	4	1	9
1995	3	4	0	7
1996	3	7	0	10
1997	3	14	1	18
1998	2	6	1	9
1999	2	7	0	9
TOTAL	19	46	3	68

Table 9. TB in Colorado: 1993-1999 Primary Drug Resistant Cases by County								
County	Year Reported							Total
	1993	1994	1995	1996	1997	1998	1999	
Adams	0	0	1	1	2	2	1	7
Alamosa	0	0	0	0	1	0	0	1
Arapahoe	0	3	0	2	4	1	1	11
Boulder	1	0	0	0	3	0	0	4
Denver	2	2	6	5	4	3	4	26
Douglas	0	0	0	0	1	0	0	1
El Paso	1	0	0	1	0	0	2	4
Jefferson	1	2	0	0	1	1	1	6
La Plata	0	0	0	1	0	0	0	1
Larimer	0	0	0	0	1	0	0	1
Morgan	0	1	0	0	0	0	0	1
Otero	1	0	0	0	0	0	0	1
Pueblo	0	0	0	0	0	1	0	1
Weld	0	1	0	0	1	1	0	3
TOTAL	6	9	7	10	18	9	9	68