Annual Tuberculosis Surveillance Report Colorado 2012

Colorado Department
of Public Health
and Environment

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Summary

The state of Colorado documented 64 new cases of active tuberculosis (TB) disease during the 2012 calendar year. This represents an 8.6% decline from the 70 cases reported in 2011. The largest declines were among the White/Caucasian population (from 10 cases in 2011 to 5 in 2012; a 50% decline) and Black/African-American population (from 16 cases in 2011 down to 9 in 2012, a 44% decline). A significant increase was seen in the Hispanic demographic group (from 19 cases in 2011 to 29 in 2012, a 53% increase). Birth in one of the 22 countries with highest TB burden (accounting for 80% of all cases of active TB disease worldwide) remains the strongest risk factor for developing active TB disease (21.9% of all 2012 cases) followed by diabetes (17.2%) and excessive alcohol use within the last year (7.8%). See **Table 1** for a more detailed demographic analysis.

Sixteen of the state's 64 counties reported at least one new case of active TB disease in 2012. Denver reported the most cases (11) of any Colorado county. Tri-County Health Department which serves the citizens of Adams, Arapahoe, and Douglas Counties saw 18 new cases of TB in 2012. Forty-five of Colorado's 64 counties have reported at least one case of active TB in the past ten years (2003-2012)—see **Table 3**.

The overall incidence rate for active TB disease in Colorado in 2012 dipped to 1.2 per 100,000 persons, as compared to the national rate in the United States of 3.2 per 100,000 according to the March 2013 TB report from the US Centers for Disease Control and Prevention (CDC). The incidence rate in the foreign-born population in Colorado (9.2 per 100,000) was 23 times that of the U.S.-born population (0.4 per 100,000). Over 70% of reported cases of TB disease were found among foreign-born persons in 2012 (45 of 64 cases)—see **Figure 8**.

There remains an ethnic/racial disparity in Colorado specific to the distribution of TB disease among minority racial and ethnic populations. In 2012, for instance, Black/African American persons made up roughly four percent of the total population of the state yet represented 14.1% of all active TB cases. Persons of Hispanic origin made up around 20% of the total Colorado population, yet represented 45.3% of all active TB cases in 2012—see **Table 7** for a more detailed analysis.

In 2012, TB cases were reported among people ranging from 13 to 95 years of age. Over 31% of TB cases occurred among people ages 65+ years old, followed by those ages 45-64 years (26.5%) and 25-44 years (20.3%)—see **Figure 3** and **Table 5** for details.

Due to the length of time it takes to complete TB drug treatment, completion rates are pending for 2012. Complete 2012 treatment completion data will be included in Colorado's 2013 Annual Surveillance Report in the spring of 2014. In 2011 (the most current year for which robust treatment completion data are available), 65 of 70 cases were eligible to complete therapy (those not eligible were either dead at diagnosis or died during treatment). Of the 65 eligible cases, 62 (95.4%) completed anti-TB drug therapy.

An individual with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not

diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. While 2012 Class BTB data are preliminary, to date there were 414 Class B notifications of which 399 were confirmed as arriving in Colorado. Of those confirmed arrivals, 343 (86.0%) were evaluated. Three of those were found to have active TB disease. See **Table 12** for more details.

Of the 47 culture-positive TB cases in 2012, eight (17.0%) were resistant to at least one TB drug. Six of the eight resistant cases were resistant to one or more of the four primary "first line" TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. There was one case of multi-drug resistant TB identified in 2012 showing resistance to isoniazid and rifampin. There were no cases of extensively drug resistant-TB (XDR-TB). See **Table 9** for five-year drug-resistance data.

In 2011, the most recent year with robust data, 38 sputum smear positive or sputum smear negative/culture positive cases yielded 493 contacts. As a result of these investigations, three active cases of TB and 84 cases of latent TB infection were identified. The 2012 data are incomplete and will not be available until completion of the 2013 Surveillance Report. **Table 1** shows demographic comparison between 2011 and 2012 active cases of TB disease.

Table 1. Demographic Comparison of 2011 and 2012 Active TB Cases

	2011		2012	
	n	% of cases	n	% of cases
Age Group (years)				
<15	8	11.4	3	4.7
15-24	6	8.6	11	17.2
25-44	25	35.7	13	20.3
45-64	22	31.4	17	26.6
65+	9	12.9	20	31.3
TOTAL	**70**	**100**	**64**	**100**
Gender				
Male	37	52.9	34	53.1
Female	33	47.1	30	46.9
TOTAL	**70**	**100**	**64**	**100**
Race/Ethnicity				
White	10	14.3	5	7.8
Black	16	22.9	9	14.1
Hispanic	19	27.1	29	45.3
American Indian/Alaska native	1	1.4	2	3.1
Asian/Pacific Islander	24	34.3	19	29.7
Multiple race	0	0	0	0
TOTAL	**70**	**100**	**64**	**100**
Region				
Denver metro[a]	53	75.7	41	64.1
Outside Denver metro	17	24.3	23	35.9
TOTAL	**70**	**100**	**64**	**100**
Country of Origin (U.S.- vs. Foreign-born)				
United States	21	30.0	19	29.7
Mexico	12	17.1	18	28.1
Other countries	37	52.9	27	42.2
TOTAL	**70**	**100**	**64**	**100**
HIV Status				
HIV Negative	61	87.1	61	95.3
HIV Positive	3	4.3	1	1.6
Testing done, results unknown	0	0	0	0
Refused testing	4	5.7	1	1.6
Not offered	2	2.9	1	1.6
Unknown	0	0	0	0
TOTAL	**70**	**100**	**64**	**100**
Risk factors[b]				
Birth in one of the 22 highest TB-burden countries[c]	18	25.8	14	21.9
Homeless within past year	4	5.7	4	6.3
Diabetes	7	10.0	11	17.2
Resident of correctional facility at diagnosis	2	2.9	2	3.1
Resident of long-term care facility	0	0	1	1.6
Injected drug use within past year	0	0	0	0
Non-injected drug use within past year	1	1.4	4	6.3
Excess alcohol use within past year	3	4.3	5	7.8
Health care worker within past year	5	7.1	2	3.1

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 Active Cases Reported in 2012

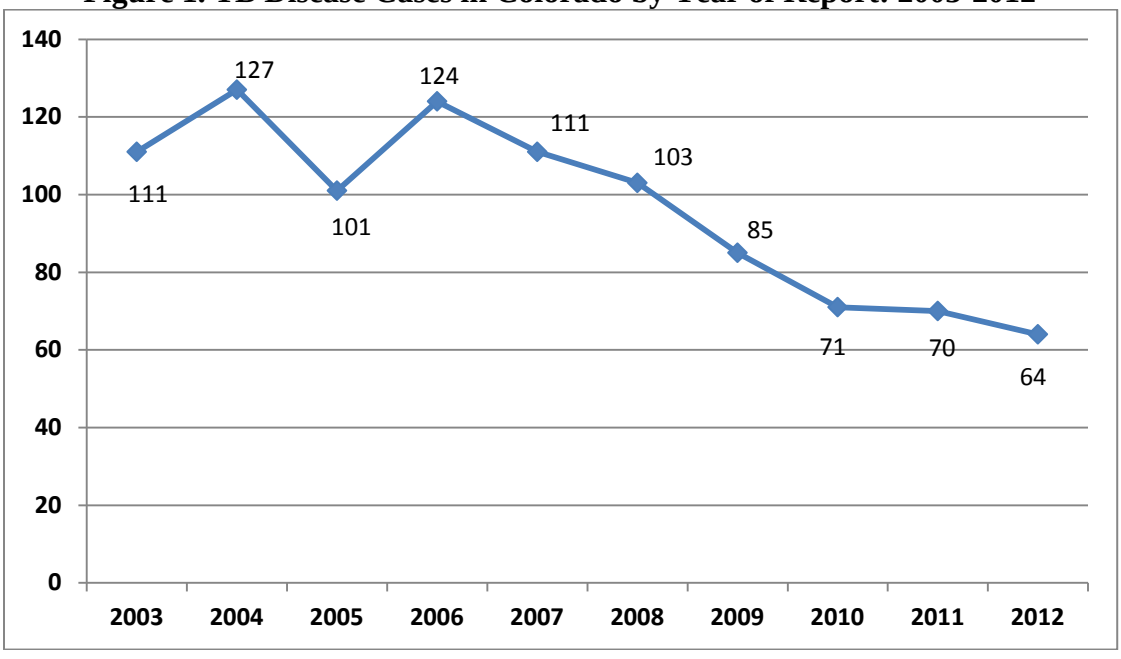
Tuberculosis Incidence

In 2012, a total of 64 active tuberculosis disease (TB) cases were reported in Colorado. As in most of the United States, Colorado has documented a slow decline in TB cases and the incidence rate of TB over the past 10 years (**Table 2**). Colorado's incidence rate has dropped from 2.7 per 100,000 in 2004 to 1.2 during 2012. **Table 2** reflects active TB disease in Colorado and the United States over the past decade and **Figure 1** shows the 10 year trend in Colorado.

Table 2. Tuberculosis Cases and Incidence Rates per 100,000 Persons, Colorado and United States, 2003-2012

	Colorado		United States	
Year	**Cases**	**Rate**	**Cases**	**Rate**
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
2010	71	1.4	11,181	3.6
2011	70	1.4	10,465	3.4
2012	64	1.2	9,951	3.2

Figure 1. TB Disease Cases in Colorado by Year of Report: 2003-2012



Tuberculosis Cases by County

Sixteen of Colorado's 64 counties reported a new case of active TB disease in 2012. Denver had the most with 11 new cases, followed by Boulder and Arapahoe (9 each), Adams (8), and Weld (7) counties **(Figure 2, Table 3).**

Figure 2. TB in Colorado: 2012 TB Cases by County

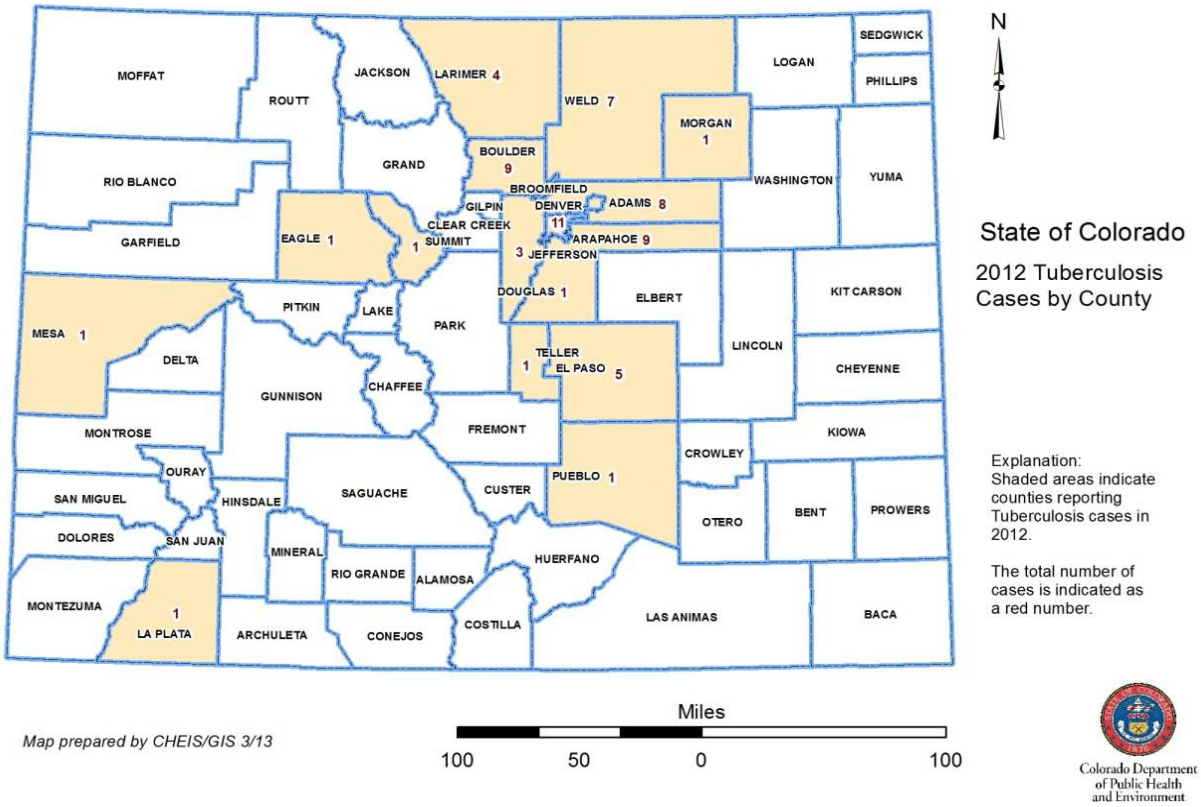


Table 3. TB in Colorado: Cases by County and Year of Report 2003-2012

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Adams*	9	13	6	17	14	14	4	6	10	8
Alamosa	0	0	1	0	0	0	0	0	0	0
Arapahoe*	20	18	17	22	17	14	11	17	5	9
Archuleta	1	0	0	0	0	0	0	0	0	0
Bent	0	0	0	0	1	0	0	0	0	0
Boulder	13	2	3	7	5	7	3	0	5	9
Broomfield	0	0	1	0	0	0	0	1	0	0
Chaffee	1	0	0	0	0	0	0	0	0	0
Clear Creek	0	0	0	0	0	0	1	0	0	0
Conejos	1	0	0	1	0	2	0	0	0	0
Crowley	0	1	0	0	0	0	0	0	0	0
Delta	0	0	0	0	1	0	1	0	0	0
Denver	38	47	42	40	37	24	29	24	23	11
Douglas*	0	3	0	1	2	3	4	1	2	1
Eagle	2	0	1	0	0	1	2	0	0	1
El Paso	4	9	9	10	7	10	7	8	7	5
Elbert	1	0	0	0	0	0	0	0	0	0
Fremont	2	0	1	0	1	0	1	1	0	0
Garfield	0	0	0	2	2	1	2	0	0	0
Grand	0	2	1	2	0	0	0	0	0	0
Gunnison	0	0	0	0	0	0	2	0	0	0
Huerfano	0	0	0	0	0	0	0	1	0	0
Jefferson	7	10	5	5	9	12	8	0	8	3
Kit Carson	0	0	0	0	0	0	0	1	0	0
La Plata	0	1	0	0	0	0	0	0	0	1
Lake	0	0	0	0	1	1	0	0	0	0
Larimer	3	2	2	4	2	3	2	5	2	4
Las Animas	0	0	0	0	2	1	2	0	0	0
Logan	0	0	1	0	0	1	0	0	0	0
Mesa	2	0	0	0	0	0	1	0	1	1
Moffat	0	0	1	0	0	0	0	0	0	0
Montezuma	0	2	0	0	1	0	0	0	0	0
Morgan	1	1	2	0	2	1	1	0	2	1
Otero	0	0	0	1	0	1	0	0	0	0
Phillips	0	0	1	0	0	0	0	0	0	0
Pitkin	0	0	1	2	0	0	0	0	0	0
Pueblo	2	3	3	2	4	3	1	2	1	1
Rio Blanco	1	1	0	0	0	0	0	0	0	0
Rio Grande	0	0	0	0	1	0	0	1	0	0
Saguache	0	0	0	0	0	1	0	0	0	0
Sedgwick	0	1	0	0	0	0	0	0	0	0
Summit	0	2	0	1	0	0	0	1	0	1
Teller	0	0	0	0	0	0	1	0	0	1
Weld	2	9	3	5	1	3	2	2	4	7
Yuma	1	0	0	2	1	0	0	0	0	0
TOTAL	**111**	**127**	**101**	**124**	**111**	**103**	**85**	**71**	**70**	**64**

Note: Only counties reporting an active case of TB (2003-2012) are included.
Note2: Highlighted counties reported at least one case of active TB in 2012.
* Tri-County Health Department comprises Adams, Arapahoe, and Douglas Counties.

The county-specific five-year mean incidence rates are provided in **Table 4**. Sixteen counties (25% of all counties) have an average incidence rate equal to or greater than the average state incidence rate of 1.5 per 100,000 over the same five-year period, though several counties have too few cases for those mean incidence rates to be significant.

Table 4. TB in Colorado: 2008-2012 Mean Incidence Rates* by County (Reporting at least one case)

						5-Year Incidence Rates 2008-2012
County	**2008**	**2009**	**2010**	**2011**	**2012**	
Adams	3.2	0.9	1.3	2.2	1.7	1.9
Arapahoe	2.5	1.9	2.9	0.9	1.5	1.9
Boulder	2.3	1.0	0.0	1.7	3.0	1.6
Broomfield	0.0	0.0	1.8	0.0	0.0	0.4
Clear Creek	0.0	10.9	0.0	0.0	0.0	2.2
Conejos	24.0	0.0	0.0	0.0	0.0	4.8
Delta	0.0	3.1	0.0	0.0	0.0	0.6
Denver	4.0	4.7	3.8	3.8	1.8	3.6
Douglas	1.1	1.4	0.3	0.7	0.3	0.8
Eagle	1.9	3.7	0.0	0.0	1.9	1.5
El Paso	1.7	1.2	1.3	1.1	0.8	1.2
Fremont	0.0	2.1	2.0	0.0	0.0	0.8
Garfield	1.8	3.5	0.0	0.0	0.0	1.0
Gunnison	0.0	13.0	0.0	0.0	0.0	2.6
Huerfano	0.0	0.0	14.4	0.0	0.0	2.9
Jefferson	2.2	1.5	0.0	1.5	0.6	1.1
Kit Carson	0.0	0.0	11.5	0.0	0.0	2.4
La Plata	0.0	0.0	0.0	0.0	1.9	0.4
Lake	12.1	0.0	0.0	0.0	0.0	2.5
Larimer	1.0	0.7	1.7	0.7	1.3	1.1
Las Animas	6.1	12.1	0.0	0.0	0.0	3.7
Logan	4.7	0.0	0.0	0.0	0.0	0.9
Mesa	0.0	0.7	0.0	0.7	0.7	0.4
Morgan	3.6	3.5	0.0	7.0	3.5	3.5
Otero	5.3	0.0	0.0	0.0	0.0	1.1
Pueblo	1.9	0.6	1.2	0.6	0.6	1.0
Rio Grande	0.0	0.0	7.9	0.0	0.0	1.6
Saguache	14.3	0.0	0.0	0.0	0.0	3.0
Summit	0.0	0.0	3.4	0.0	3.5	1.4
Teller	0.0	4.4	0.0	0.0	4.3	1.7
Weld	1.2	0.8	0.8	1.5	2.7	1.4
Colorado	**2.1**	**1.7**	**1.4**	**1.4**	**1.2**	**1.5**

*TB disease per 100,000 persons

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

Note 2: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.

Tuberculosis by Age Group

In 2012, TB cases were reported among people ranging from 13 to 95 years of age. Over 31% of TB cases occurred among people 65+ years old, followed by those ages 45-64 years (26.5%) and 25-44 years (20.3%).

Three cases of pediatric TB (<15 years of age) were reported in 2012. Active TB in children is particularly concerning, as it is indicative of ongoing transmission in the community as well as evidence of missed opportunities for preventive therapy. Of those three pediatric cases, none were younger than five years of age **(Figure 3).**

Figure 3. 2012 Active TB Cases by Age Group (n=64)

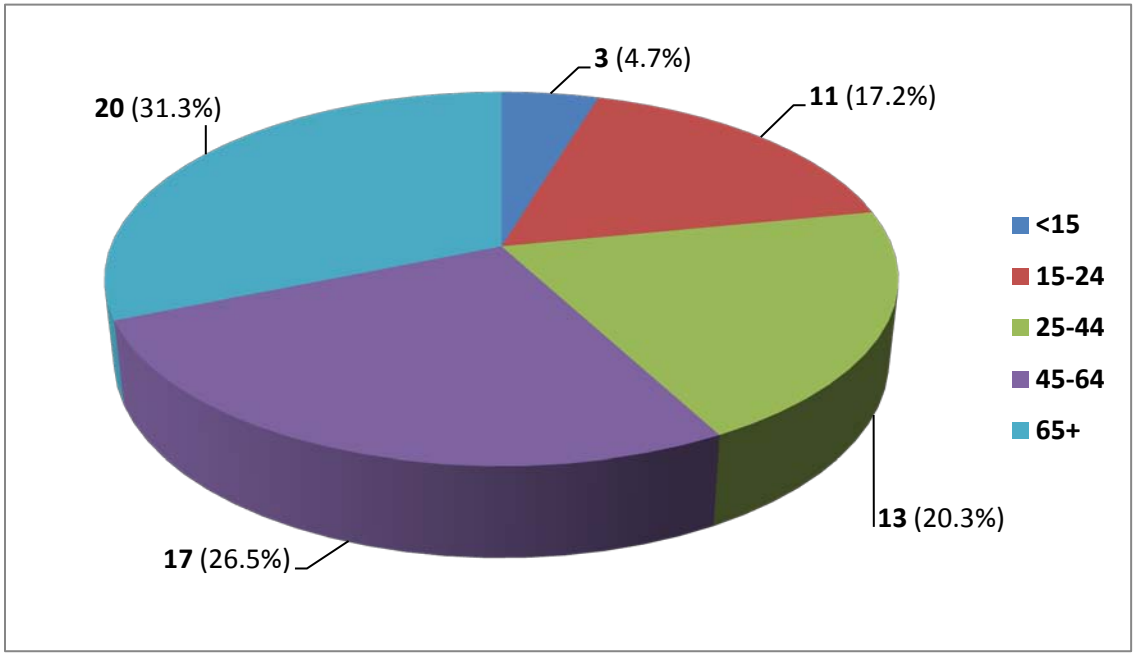


Table 5 shows that in 2012 the highest TB incidence rate was among persons 85+ years of age (5.3 cases per 100,000) and lowest (among groups with at least one documented case) among those 40-44 years (0.3 cases per 100,000). The largest decline was seen among children <15 where cases dropped from 8 cases in 2011 to 3 in 2012. In contrast, there was a significant increase in TB cases among those 85+ years old over the same period from 0 in 2011 to 4 (5.3 per 100,000) in 2012. **Table 6** shows the age groups relative to nativity (U.S.-born and foreign-born).

Table 5. TB in Colorado: 2011 & 2012 Reported Cases by Gender and Age Group

Age Group	2011				2012			
	Male	Female	Total	Rate*	Male	Female	Total	Rate*
0 to 4	0	5	5	1.4	0	0	0	0
5 to 9	0	1	1	0.3	0	0	0	0
10 to 14	1	1	2	0.6	1	2	3	0.9
15 to 19	0	2	2	0.6	3	1	4	1.1
20 to 24	1	3	4	1.1	3	4	7	2.0
25 to 29	4	4	8	2.1	2	2	4	1.1
30 to 34	3	6	9	2.5	3	2	5	1.3
35 to 39	2	1	3	0.8	1	2	3	0.9
40 to 44	4	1	5	1.4	0	1	1	0.3
45 to 49	4	0	4	1.1	3	4	7	2.0
50 to 54	8	2	10	2.7	4	2	6	1.6
55 to 59	5	2	7	2.1	2	0	2	0.6
60 to 64	1	0	1	0.4	2	0	2	0.7
65 to 69	0	3	3	1.6	3	2	5	2.3
70 to 74	1	1	2	1.6	4	1	5	3.5
75 to 79	2	1	3	3.1	1	4	5	4.9
80 to 84	1	0	1	1.4	1	0	1	1.3
85+	0	0	0	0	1	3	4	5.3
TOTAL	**37**	**33**	**70**	**1.4**	**34**	**30**	**64**	**1.2**

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

Table 6. TB in Colorado: 2011 & 2012 Case Comparison by Age Group and Patient Nativity

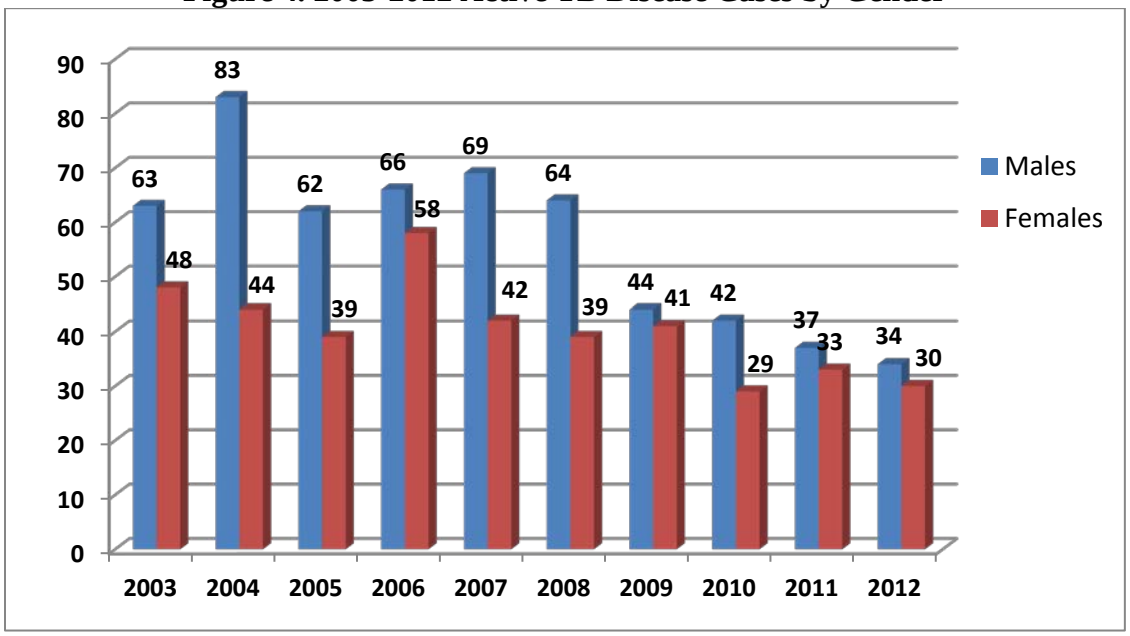
	2011			2012		
Age Group	**U.S.-Born**	**Foreign-Born**	**Total**	**U.S.-Born**	**Foreign-Born**	**Total**
0-4	5	0	5	0	0	0
5-14	1	2	3	1	2	3
15-24	1	5	6	2	9	11
25-34	3	14	17	1	8	9
35-44	0	8	8	1	3	4
45-54	4	10	14	5	8	13
55-64	4	4	8	1	3	4
65-74	1	4	5	4	6	10
75-84	2	2	4	3	3	6
85+	0	0	0	1	3	4
TOTAL	**21**	**49**	**70**	**19**	**45**	**64**

Tuberculosis by Gender

Tuberculosis tends to infect and lead to active TB disease in males more often than females. This finding may be due to disparities in access to care, differing health-seeking behaviors, underlying biological susceptibility to TB or the distribution of risk factors such as substance abuse, incarceration (living in a congregate setting), and homelessness. Gender-specific cases over the last 10 years are found in **Figure 4**. In 2012, the usual TB

gender disparity was less-pronounced than in some previous years with 34 males (53.1% of total; comparable with 52.8% in 2011) and 30 females.

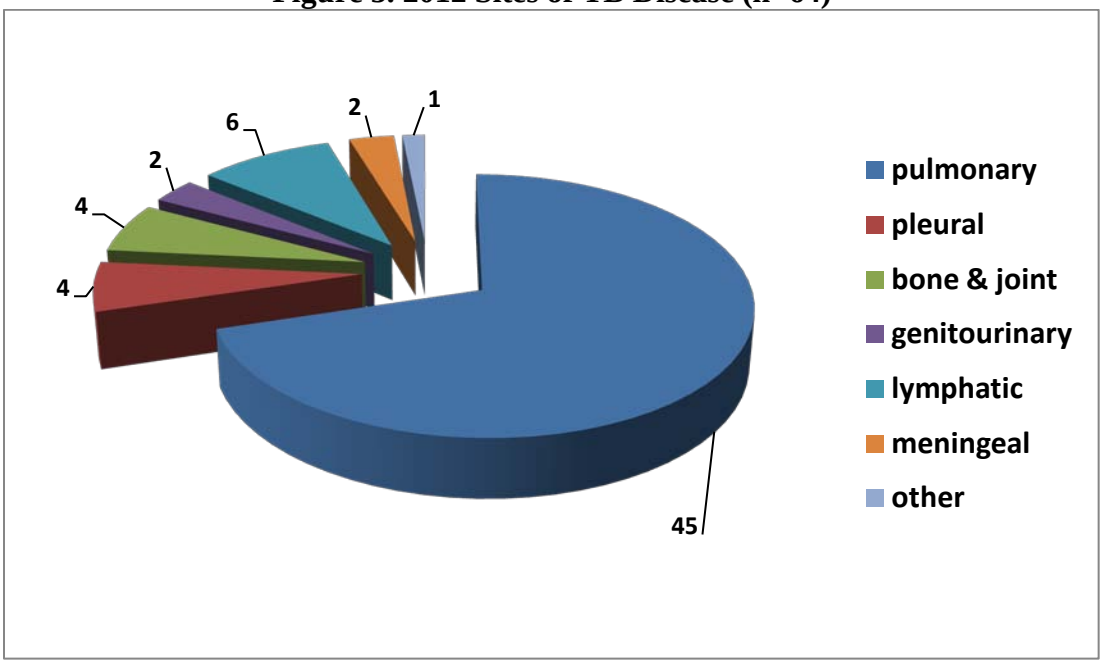
Figure 4. 2003-2012 Active TB Disease Cases by Gender



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 or brain, lymph nodes, bones or joints, and genitourinary tract. In 2012, 45 of the 64 (70.3%) cases were pulmonary or had both a pulmonary and extrapulmonary site of disease, which is consistent with recent years' surveillance. The next most common site of infection in 2012 was the lymph system (cervical, intrathoracic or axillary) with 6 cases (9.4%). There were two cases of M. bovis infection in 2012; one male and one female both PZA resistant (by definition). The male had pulmonary TB while the female had bone/joint site of disease. One other case was PZA resistant, but without an M. bovis genotype. **Figure 5** shows the major anatomical sites of TB disease among 2012 cases.

Figure 5. 2012 Sites of TB Disease (n=64)



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. The distribution of cases in 2012 reflects some marked differences from recent years. The biggest changes of note were among Hispanics. Among those self-identifying as Hispanic, cases increased from 19 in 2011 to 29 in 2012; an increase of almost 53%. **See Figure 6 and Figure 7** for a full breakdown. The most significant decrease across the most-recent two years was seen among the Black/African American demographic. There were 9 cases in 2012, down from 16 in 2011; a nearly 44% decline. As observed nationally, there also exists an ethnic/racial disparity in Colorado specific to the distribution of TB disease among racial and ethnic minorities. This is a major concern to the state of Colorado's TB Program. In 2012 for instance, Black/African American persons comprised roughly 4% of the total population of the state, yet represented 14% of all active TB cases. Persons of self-identifying as of Hispanic origin made up roughly 22% of the total Colorado population, yet they represented over 45% of all active TB cases in 2012.

Figure 6. 2003-2012: TB Cases Self-Identifying as White vs. Non-White

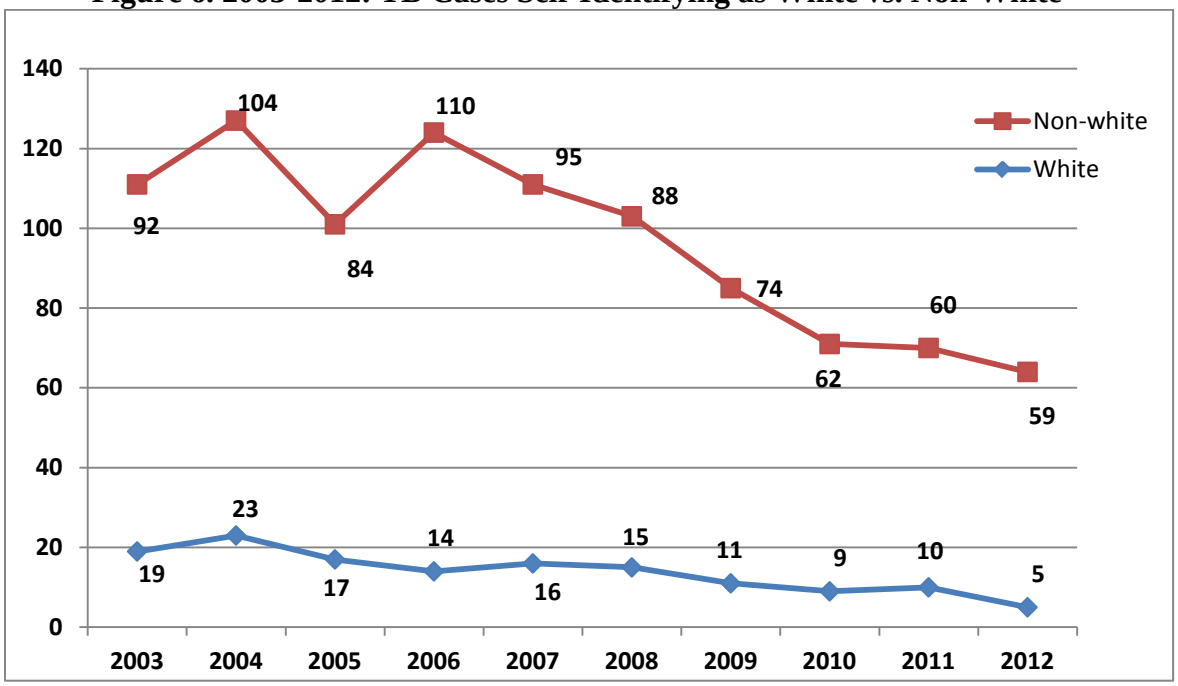
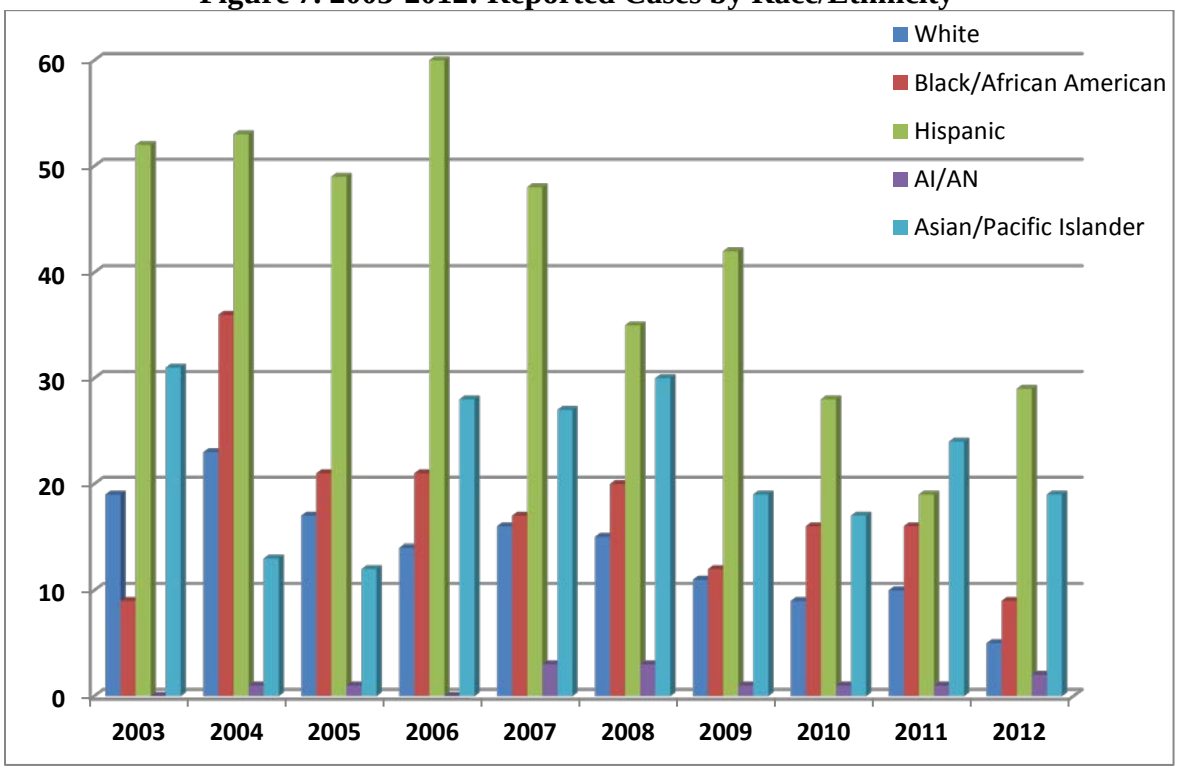


Figure 7. 2003-2012: Reported Cases by Race/Ethnicity



The United States Centers for Disease Control and Prevention (CDC) considers Colorado a low-incidence state in relation to reportable TB disease (defined as a incidence rate less than 3.5 per 100,000 persons); however, incidence rates in the Black/African-American, Asian/Pacific Islander, and American Indian/Alaskan Native (AI/AN) populations all

exceeded the "low-incidence" threshold. **Table 7** compares race and ethnicity TB incidence rates from 2011 and 2012.

Table 7. TB in Colorado: 2011 and 2012 Cases by Race/Ethnicity

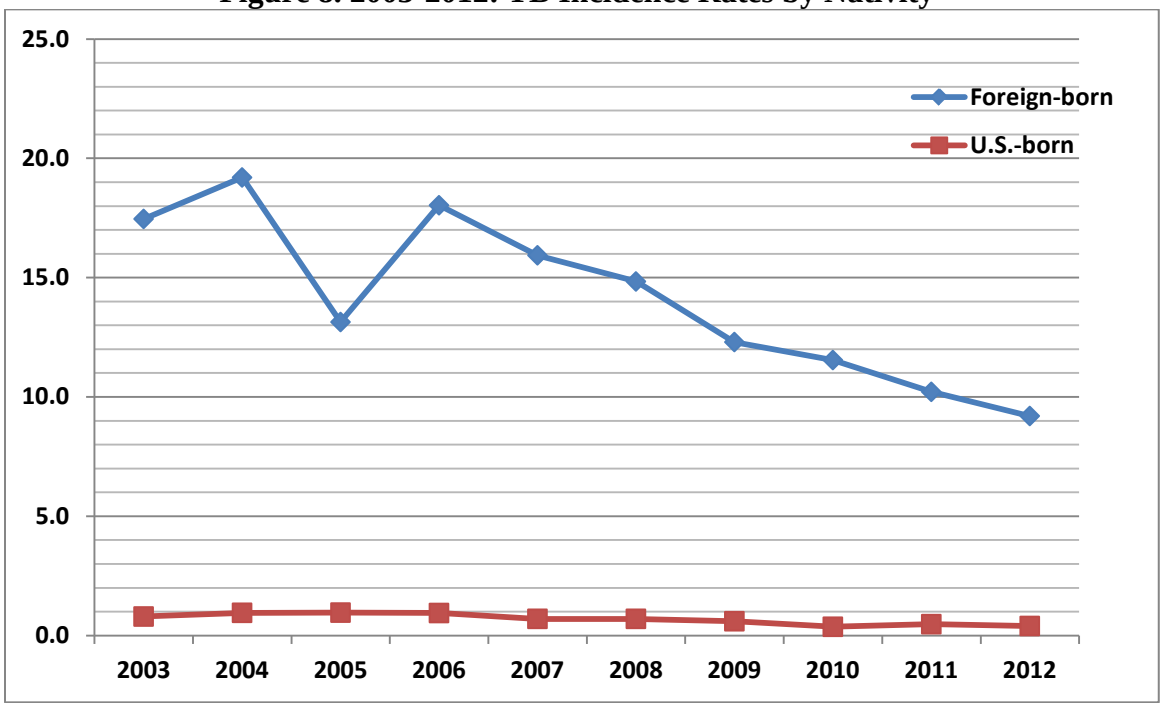
	2011		2012	
Race/ethnicity	Number of Cases (% of total)	Incidence Rate*	Number of Cases (% of total)	Incidence Rate*
White/Caucasian	10 (14.3)	0.3	5 (7.8)	0.1
Black/African-American	16 (22.9)	8.8	9 (14.1)	4.7
Hispanic	19 (27.1)	1.9	29 (45.3)	2.8
Asian/Pacific Islander	24 (34.3)	17.7	19 (29.7)	14.0
American Indian/AK native	1 (1.4)	3.4	2 (3.1)	7.3
TOTAL	**70 (100)**	**1.4**	**64**	**1.2**

*Per 100,000 persons
Note: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.
Note2: percentages may not equal 100 due to rounding.

TB Incidence Rates by Nativity

In 2012, the TB incidence rate in the foreign-born population living in Colorado was 9.2 per 100,000 persons, which is 23 times higher than that of the U.S.-born population (0.4 per 100,000). Since 2003, more than two-thirds (69.1%) of the cases of TB disease reported in Colorado were among foreign-born individuals **(Figure 8 and Figure 9**).

Figure 8. 2003-2012: TB Incidence Rates by Nativity



In 2012, 45 foreign-born cases of TB were reported in Colorado, representing 70.3% of all cases for the year. The largest single foreign-born cohort came from Mexico with 18 cases, up from 12 in 2011, a 50% increase. One of the most striking surveillance trends

over the last two years has been the proportional increase in U.S.-born cases. In fact, the U.S.-born TB cohort has been the largest of any single country in both 2011 and 2012. Nineteen of 64 cases in 2012 (29.6% of total) were born in the U.S. The next biggest national cohort was Mexico with 18 cases (28.1%). **Table 8** shows a breakdown of the countries of origin for all active cases of TB disease from 2008-2012. The 2012 cases are highlighted. Of those foreign-born cases (n=45), 14 (31.1%) came from one of the top 22 highest-burdened countries that comprise 80% of all global cases of active TB disease.

Figure 9. 2003-2012: Reported TB Cases U.S.- vs. Foreign-born

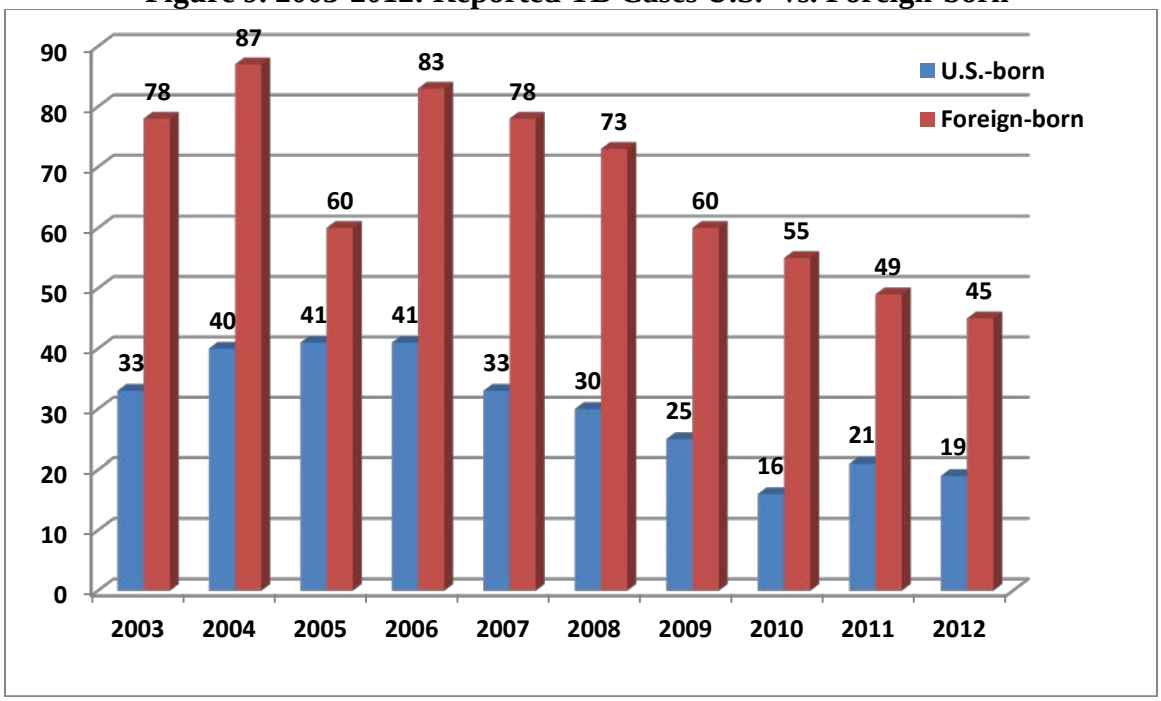


Table 8. Comparison of Colorado TB Cases by Country of Nativity, 2008-2012

Country	2008	2009	2010	2011	2012
Austria	0	1	0	0	0
Bangladesh*	0	0	2	0	0
Bhutan	2	2	1	1	2
Burma/ Myanmar*	2	1	2	1	0
Burundi	0	0	0	0	1
Canada	0	0	1	0	0
China*	2	0	1	1	2
Cuba	1	0	0	0	0
DRC*	0	0	0	1	0
El Salvador	2	1	0	0	0
Eritrea	1	0	1	2	0
Ethiopia*	4	3	4	2	3
Fiji	0	0	0	1	0
Germany	0	0	1	0	0
Guam	0	0	1	0	0
Guatemala	0	1	0	0	0
Haiti	0	0	0	0	1
Honduras	1	1	0	1	1
India*	5	5	1	4	3
Indonesia*	0	1	2	1	1
Italy	0	0	0	1	0
Jamaica	0	0	1	0	0
Kenya*	1	3	0	2	1
Korea	1	0	1	2	0
Laos	1	0	0	1	2
Liberia	1	0	1	0	0
Madagascar	1	0	0	0	0
Mexico	22	26	22	12	18
Micronesia	0	0	0	0	1
Mongolia	1	1	0	0	0
Morocco	1	0	0	0	0
Nepal	3	2	0	3	4
Pakistan*	0	0	0	1	0
Palau	0	0	1	0	0
Peru	2	1	1	0	1
Philippines*	3	3	3	2	2
Rwanda	1	1	1	0	0
Senegal	0	0	1	0	0
Somalia	5	2	4	5	0
Taiwan	0	0	0	1	0
Tonga	0	0	0	1	0
U.S.	30	25	16	21	19
Viet Nam*	7	5	2	3	2
Total cases	**103**	**85**	**71**	**70**	**64**

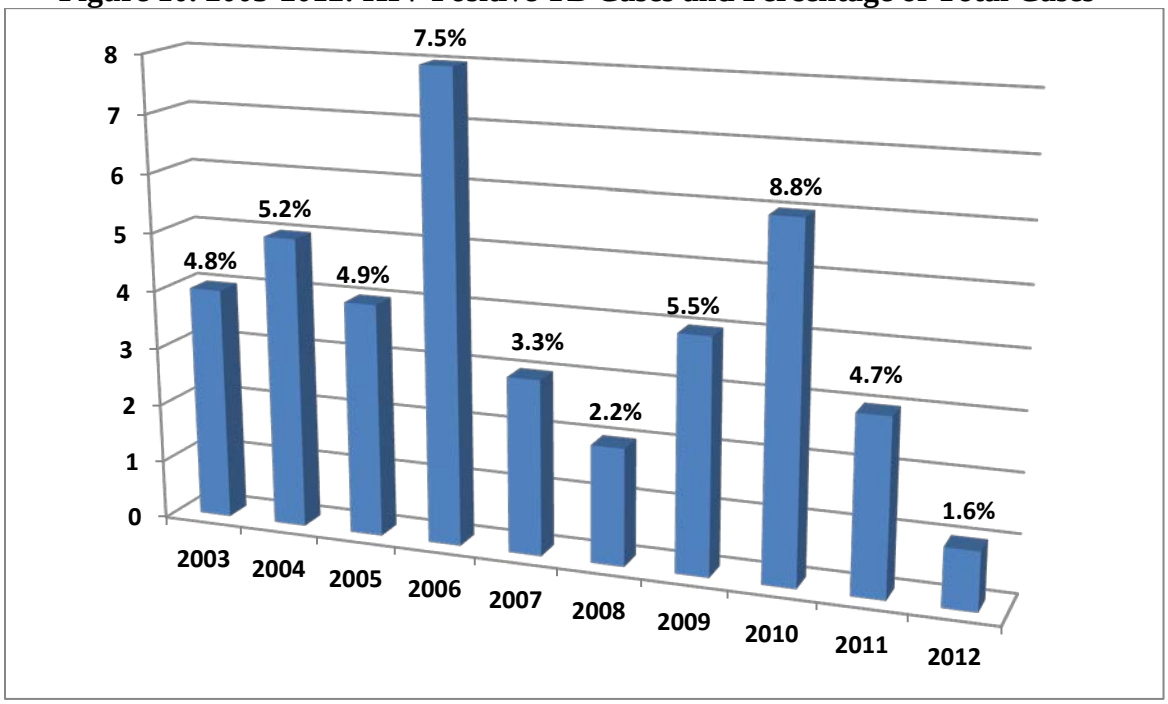
Note: only 2012 cases/countries of origin are highlighted

*One of the 22 high-burden countries

HIV Co-infection

Worldwide, one in four people with HIV who die of AIDS-defining conditions do so as a result of TB complications. HIV-infected people with latent TB infection (LTBI) are at higher risk of active TB because HIV weakens the immune system, greatly increasing the likelihood of progression from latent infection to active TB disease. Of the 64 cases of TB in 2012, test results for HIV were available for 62 (96.9% of total cases) and, of those, one person was found to be co-infected with HIV. Of the two outliers; one patient refused an HIV test and one was not offered an HIV test. Until every person with active TB disease is offered an HIV test that includes an explanation of the medical necessities for such a test, this will remain an area for improvement. **Figure 10** shows the total number of HIV cases among TB patients over the last 10 years, as well as the percentage of the annual cases with HIV/TB co-morbidity each of those years.

Figure 10. 2003-2012: HIV Positive TB Cases and Percentage of Total Cases



Drug Resistance and TB

Of the 64 TB cases in 2012, 47 (73.4%) had a positive culture. And of those 47, eight were resistant to at least one TB drug. Six of those eight (75%) cases were resistant to one or more of the four primary/first-line TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of those six cases, three were resistant to pyrazinamide alone; one was resistant to isoniazid and streptomycin; one was resistant to rifampin, ethambutol, and streptomycin; and one case was multi-drug resistant (MDR) showing resistance to isoniazid and rifampin. The other two cases were resistant to streptomycin (not considered a primary/first-line TB drug) alone. There were no cases of extensively-drug resistant TB (XDR-TB) identified in 2012. See **Table 9** for a full break down of drug susceptibilities over the past five years.

Table 9. TB in Colorado: 2008-2012 Drug Susceptibilities

	2008	2009	2010	2011	2012
TB Drug(s)	**Number Resistant**	**Number Resistant**	**Number Resistant**	**Number Resistant**	**Number Resistant**
isoniazid only	7	3	5	4	0
pyrazinamide only	4	3	2	4	3
ethambutol only	1	0	0	1	0
isoniazid and streptomycin	0	3	0	1	1
isoniazid and rifampin	0	0	0	0	1
pyrazinamide and streptomycin	0	1	0	0	0
streptomycin only	2	1	1	1	2
streptomycin and ethionamide	1	0	0	0	0
isoniazid, streptomycin and ethambutol	0	0	0	1	0
isoniazid, streptomycin and ethionamide	1	0	0	0	0
isoniazid, rifampin, ethambutol, pyrazinamide and streptomycin	0	0	1	1	0
rifampin, ethambutol & streptomycin	0	0	0	0	1
Total	**16**	**11**	**9**	**13**	**8**

Directly Observed Therapy (DOT)

Directly observed therapy (DOT) is the standard of care for administering TB medications to patients with active TB disease. Directly observed therapy is required for all pulmonary cases of TB in Colorado and involves health care workers observing the patient taking his/her medications to ensure compliance with, and completion of, the treatment regimen. During 2011 (the most recent year with complete data), there were 68 patients who were treated for active TB disease; two others were dead at TB diagnosis. All 68 received TB treatment through DOT, self-administered treatment or a combination of both. In 2012 to date, 26 patients have initiated TB treatment; all of whom have received treatment via DOT or a combination of these modalities. **Table 10** presents the number and percentage of cases receiving DOT in 2010 and 2011 along with preliminary 2012 data.

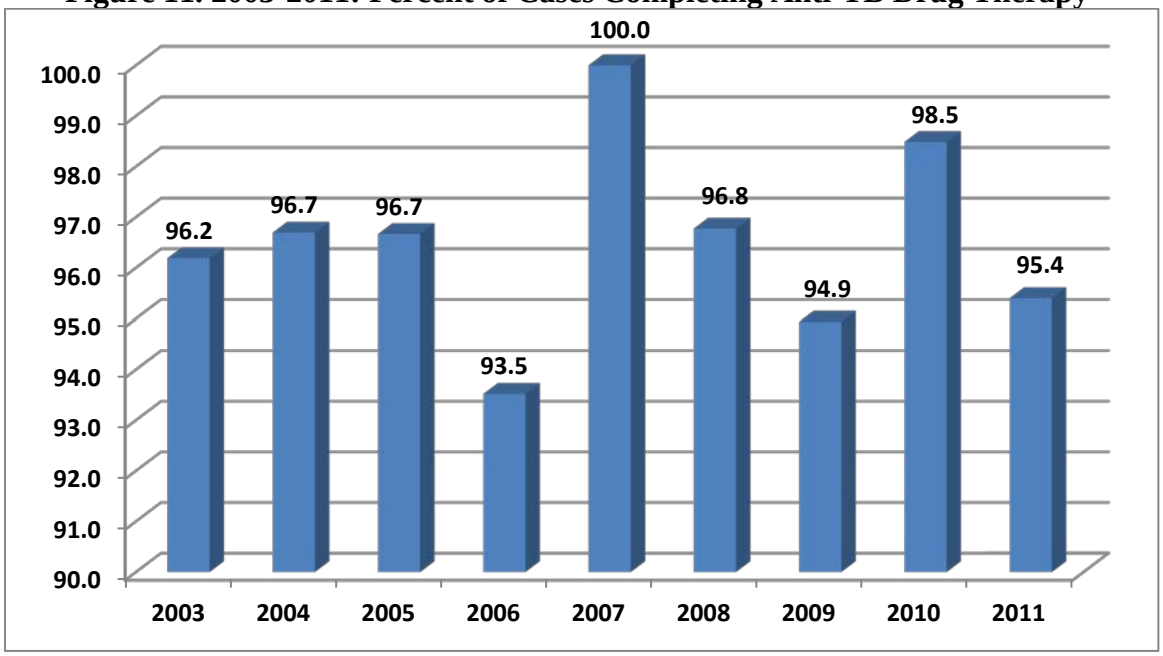
Table 10. Number & Percentage of Patients Receiving DOT and/or SAT: 2010-2012

	2010		2011		2012*	
	N	%	N	%	N	%
DOT only	57	81.4	59	84.3	21	77.8
DOT + self administered	12	17.1	6	8.6	2	7.4
Self administered only	1	1.4	3	4.3	3	11.1
Dead at diagnosis	0	0	2	2.9	1	3.7
TOTAL	**70**	**100**	**70**	**100**	**27**	**100**
*2012 data are preliminary; 37 of 64 cases are pending						

Completion of TB Treatment

The standard treatment for active TB disease is six months in duration and utilizes the four "first-line" TB drugs: isoniazid, pyrazinamide, rifampin, and ethambutol. In 2011, (the most recent year for which robust treatment completion data are available), 65 of the 70 total cases were eligible to complete therapy. Of the 65 eligible cases, 62 (95.4%) completed therapy, one (1.5%) moved outside the U.S., two (3.1%) were lost to follow-up, and five (not counted in the denominator) died on treatment or were dead at time of TB diagnosis. Treatment completion data for 2012 will be described in more detail in the 2013 surveillance report when these data will be more complete. **Figure 11** includes updated 2011 treatment completion data, along with complete data for the previous eight years.

Figure 11. 2003-2011: Percent of Cases Completing Anti-TB Drug Therapy



Contact Investigations

The Colorado Department of Public Health and Environment's TB Program is responsible for TB control throughout the state of Colorado, which includes the public health imperative to conduct contact investigations on all cases of infectious (pulmonary,

pleural 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 from 2002-2011 (2011 data is preliminary and preliminary data for 2012 will be available when the 2013 surveillance report is completed). While still preliminary, in 2011, 38 sputum smear positive or sputum smear negative/culture positive cases yielded 493 contacts. As a result of these investigations, three active cases of TB disease and 84 cases of latent TB infection were identified. Of those 84 cases, 67 have started LTBI treatment (80%) and 54 patients (81%) completed LTBI treatment.

Table 11. Follow-up and Treatment for Contacts to Active Tuberculosis Cases, 2002-2011

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Number of sputum smear positive or sputum smear negative, culture positive cases	60	45	48	44	64	40	44	41	34	38
Total contacts	1,388	593	1,462	1,317	1,523	594	1,185	490	602	493
Average contacts per infectious case	23.1	13.1	30.5	29.9	23.7	14.8	26.9	11.9	17.8	13.0
Number (%) of contacts evaluated*	1,017 (73%)	489 (82%)	1,170 (80%)	1,113 (85%)	1,290 (85%)	432 (73%)	998 (84%)	447 (91%)	560 (93%)	386 (78%)
Number (%) of contacts with latent TB infection	253 (25%)	111 (23%)	351 (30%)	220 (20%)	274 (21%)	127 (29%)	160 (16%)	176 (39%)	138 (25%)	84 (22%)
Number (%) of infected contacts starting treatment	164 (65%)	89 (80%)	276 (79%)	179 (81%)	217 (79%)	101 (79%)	128 (80%)	149 (85%)	131 (95%)	67 (80%)
Number (%) of contacts starting treatment who completed treatment	121 (74%)	63 (71%)	187 (68%)	129 (72%)	146 (67%)	83 (82%)	82 (63%)	108 (72%)	106 (81%)	54 (81%)
Number (%) of contacts with active TB disease	2 (<1%)	3 (<1%)	16 (1%)	7 (<1%)	9 (<1%)	3 (<1%)	2 (<1%)	2 (<1%)	6 (1.1%)	3 (<1%)

Note: Evaluated = symptom check and tuberculin skin test/IGRA, chest x-ray, sputum studies as indicated.
*2011 data are preliminary; preliminary 2012 data to follow in 2013 Surveillance Report.

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 with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. The Division of Global Migration and Quarantine notifies CDPHE's TB Program of all class B1 and B2 individuals who are entering the state. The CDPHE TB Program forwards these referrals to the local health departments in the counties where the individual will reside. The local health departments provide medical evaluations and treatment for infection, whether active or latent. In 2012, there were 414 Class B notifications of which 399 were confirmed as arriving in Colorado. Of those 399 arrivals, 343 (86%) were evaluated. Three of those were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2008-2012 in Colorado.

Table 12. Colorado Class BTB Data 2008-2012

	2008		2009		2010		2011		2012*	
	n	%	n	%	n	%	n	%	n	%
Class BTB notifications	252		312		325		303		414	
Moved prior to evaluation	20	7.9%	16	5.1%	25	7.7%	24	7.9%	15	3.6%
Arrivals	232	92.1%	296	94.9%	300	92.3%	279	92.1%	399	96.4%
Evaluated	196	84.5%	215	72.6%	259	86.3%	260	93.2%	343	86.0%
TB disease	5	2.6%	2	0.9%	5	1.9%	2	0.8%	3	0.9%
INH recommended	105	53.6%	114	53.0%	102	39.4%	102	39.2%	101	29.4%
Start treatment	92	87.6%	93	81.6%	83	81.4%	85	83.3%	75	74.3%
Complete treatment	72	78.3%	74	79.6%	73	88.0%	77	90.6%	49	65.3%
On treatment	0	0.0%	0	0.0%	0	0.0%	0	0.0%	20	26.7%

*preliminary data

Moving Forward

The Colorado Department of Public Health and Environment's TB Program maintains close working partnerships with local health departments, regional states' TB programs, as well as federal agencies in collaborative efforts to prevent, screen for, and treat TB in Colorado. While cases and incidence rates decline, the importance of tracking and ensuring treatment completion will remain paramount. Emphasis on completion of treatment requires close collaboration with local health departments and other partners to prevent both the further spread of the disease and the emergence of drug-resistant TB due to incomplete or interrupted drug treatment regimens. An emphasis on 100% HIV testing compliance among persons with active TB disease will continue for well-documented reasons; it should be noted that HIV testing rates are outstanding over the last several years in Colorado and all surveillance suggests that will continue. Colorado's TB Program will actively seek and advocate for close collaboration with community

stakeholders throughout the state as well as other CDPHE disease prevention programs including the HIV/STI and Viral Hepatitis. Moving forward, the TB Program will be promoting the increased use of interferon-gamma release assays (IGRAs) to test for both LTBI and active TB disease among those populations CDC guidelines suggest will benefit most from this screening tool. Identifying opportunities to increase the use of 12 doses (once weekly for twelve weeks) of isoniazid and rifapentine (3HP) to treat LTBI will continue in efforts to both increase LTBI completion rates and reduce the adverse drug events documented using other treatment regimens.