

# Vaccine Preventable Diseases in Colorado

Measles, Rubella, Congenital Rubella, Hepatitis A, Hepatitis B, Diphtheria,  
Tetanus, Mumps, Polio, Pertussis, *Haemophilus influenzae*,  
Meningococcal Disease, and Pneumococcal Disease

## Surveillance Report: 2002



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## Introduction

This report highlights 2002 surveillance data for vaccine preventable diseases in Colorado. Vaccine preventable diseases reported in Colorado during 1998-2002 are summarized below in Table 1.

**Table 1. Reported Cases of Vaccine Preventable Diseases, Colorado\*, 1998 – 2002†**

Report Year	Measles	Mumps	Rubella	Congenital Rubella	Tetanus	Pertussis	Invasive Meningococcal Disease	Invasive Pneumococcal Disease**	Invasive H. Flu	Hepatitis A	Acute Hepatitis B
1998	0	7	0	0	0	357	30	--	21	348	102
1999	0	5	1	1	0	311	36	--	14	219	99
2000	2	1	1	0	0	488	33	180	33	223	108
2001	0	3	0	0	1	389	33	316	38	88	100
2002	0	2	0	0	0	464	23	392	36	75	81

\* No diphtheria or polio cases were reported during 1998 – 2002.

† Only confirmed cases are included, except for pertussis which also includes “probable” cases.

\*\*As of November 30, 2001 invasive pneumococcal disease became reportable statewide. Prior to November 30, 2001, pneumococcal meningitis was reportable statewide, and all invasive pneumococcal disease was reportable from the 5-county Denver metro area (beginning 7/01/00).

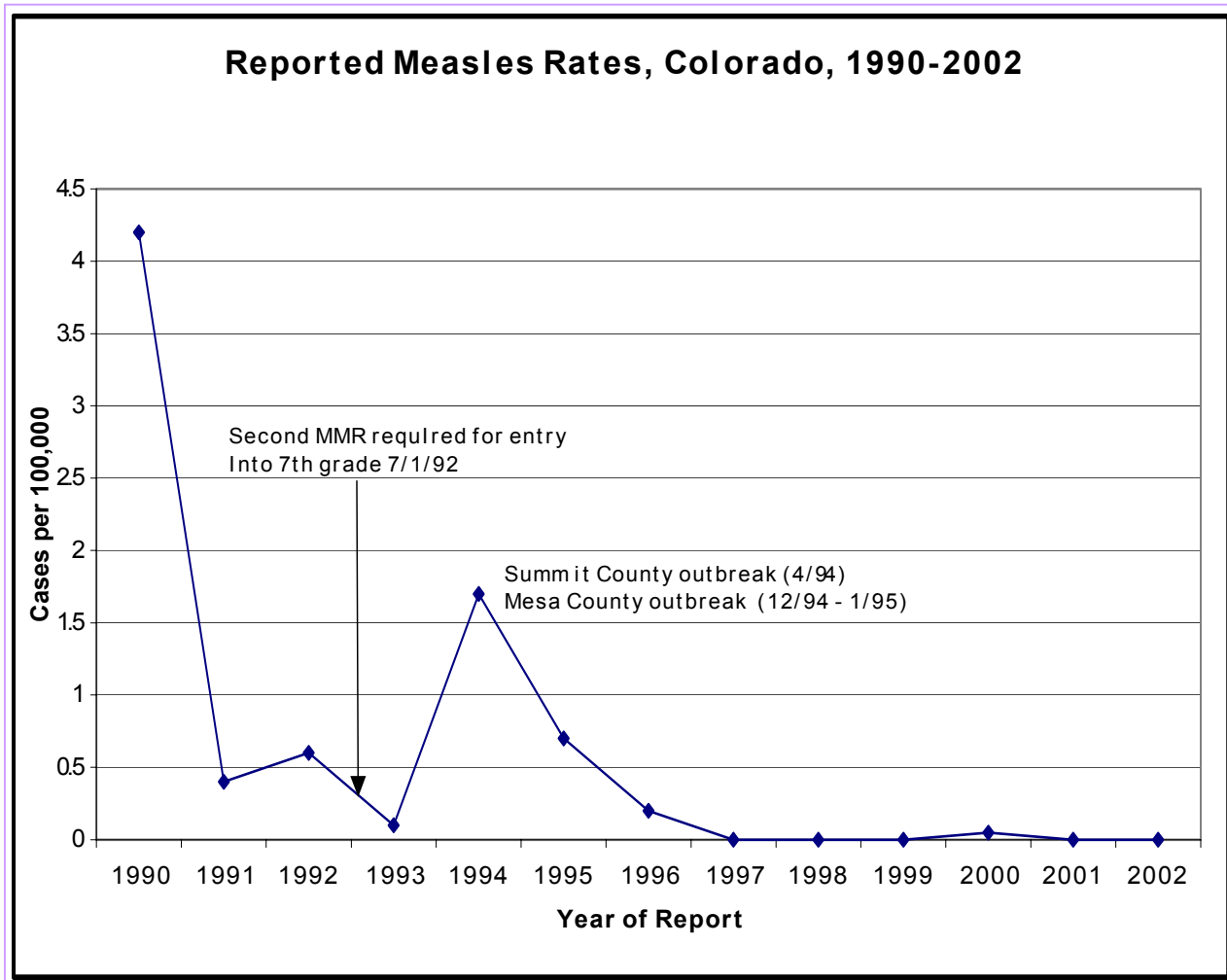
Rates in this report were calculated as cases per 100,000 population. Colorado rates were calculated using 2002 population figures from the 2002-based population projections from the Demography Section, Colorado Division of Local Government, unless otherwise noted. National rates were calculated using United States Census Bureau data as of July 1, 2002.

## Measles

During 2002, no measles cases were reported in Colorado. The last measles cases in Colorado were reported in 2000 from Boulder County. Prior to 2000, the last reported cases of measles occurred in 1996 when 7 cases were reported.

The measles incidence rate in Colorado has decreased from 1.7/100,000 in 1994 to 0.0/100,000 in 2002. Only 44 measles cases were reported in the United States during 2002 for an incidence rate of 0.02/100,000. Figure 1 shows Colorado measles rates from 1990 – 2002. The Colorado school immunization requirement for two measles vaccinations was implemented July 1992.

Figure 1.



### **Rubella**

In 2002, no rubella cases were reported in Colorado; however, a case with illness onset in late 2002 was reported in early 2003. The ten-year annual average (1993-2002) for rubella was 0.8 cases in Colorado. There were 18 rubella cases reported in the United States during 2002, for an incidence rate of 0.006/100,000.

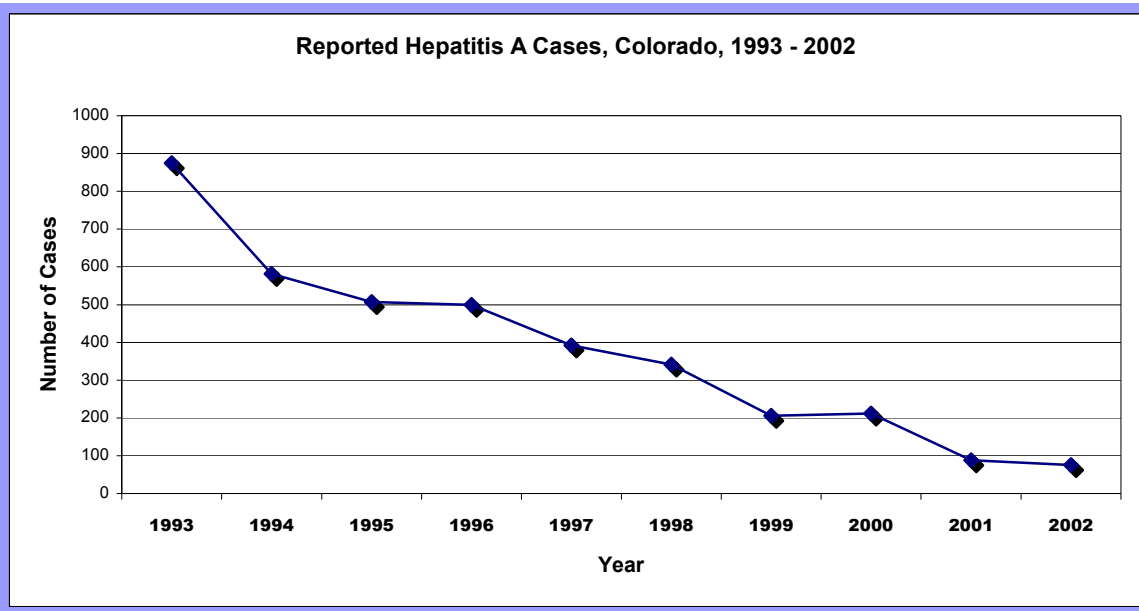
### **Congenital Rubella**

No cases of congenital rubella syndrome were reported in Colorado during 2002. In the past 10 years (1993 – 2002), only one congenital rubella syndrome case was reported (1999). Only one congenital rubella case was reported in the United States during 2002.

## Hepatitis A

A total of 75 hepatitis A cases were reported in Colorado during 2002, which represents an 8.0% decrease from the 88 cases reported in 2001. Hepatitis A has decreased steadily since 1993 in Colorado with an incidence rate of 1.7/100,000 in 2002. The United States 2002 hepatitis A incidence rate was 3.1/100,000, with 8,795 cases reported. Figure 2 displays reported cases of hepatitis A in Colorado since 1993.

Figure 2.



Hepatitis A cases and rates by age group and gender (Table 2) and by year and county of residence (Table 3) are presented in the following two tables.

<b>Table 2. Reported Hepatitis A Rates by Age Group &amp; Gender, Colorado 2002</b>						
<b>Age Group (years)</b>	<b>Male</b>		<b>Female</b>		<b>Total</b>	
	<b>Cases</b>	<b>Rate</b>	<b>Cases</b>	<b>Rate</b>	<b>Cases</b>	<b>Rate</b>
0-1	0	0.0	0	0.0	0	0.0
2-4	3	3.1	2	2.2	5	2.7
5-9	3	1.9	5	3.3	8	2.6
10-14	4	2.4	1	0.6	5	1.6
15-19	6	3.4	2	1.2	8	2.4
20-39	21	3.0	11	1.7	32	2.4
40+	9	1.0	8	0.8	17	0.9
<b>Total</b>	<b>46</b>	<b>2.0</b>	<b>29</b>	<b>1.3</b>	<b>75</b>	<b>1.7</b>

**Table 3. Reported Hepatitis A Cases and Rates by County, Colorado  
1998 – 2002**

County	Number of Cases by Year of Report					Average Annual # of cases	Average Rate for 5 Years*
	1998	1999	2000	2001	2002		
<b>Adams</b>	<b>32</b>	<b>13</b>	<b>15</b>	<b>12</b>	<b>12</b>	<b>16.8</b>	<b>4.6</b>
<b>Alamosa</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>*</b>
<b>Arapahoe</b>	<b>43</b>	<b>24</b>	<b>21</b>	<b>7</b>	<b>7</b>	<b>20.4</b>	<b>4.2</b>
<b>Archuleta</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Baca</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Boulder</b>	<b>17</b>	<b>14</b>	<b>15</b>	<b>3</b>	<b>3</b>	<b>10.4</b>	<b>3.6</b>
<b>Chaffee</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.0</b>	<b>6.1</b>
<b>Cheyenne</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Clear Creek</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Crowley</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Custer</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Delta</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0.4</b>	<b>*</b>
<b>Denver</b>	<b>134</b>	<b>56</b>	<b>69</b>	<b>23</b>	<b>14</b>	<b>59.2</b>	<b>10.7</b>
<b>Douglas</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>2.6</b>	<b>1.4</b>
<b>Eagle</b>	<b>2</b>	<b>6</b>	<b>3</b>	<b>8</b>	<b>2</b>	<b>4.2</b>	<b>10.0</b>
<b>El Paso</b>	<b>16</b>	<b>3</b>	<b>17</b>	<b>1</b>	<b>3</b>	<b>8.0</b>	<b>1.5</b>
<b>Fremont</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1.2</b>	<b>2.6</b>
<b>Garfield</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1.2</b>	<b>2.7</b>
<b>Gilpin</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0.4</b>	<b>*</b>
<b>Grand</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0.8</b>	<b>6.4</b>
<b>Gunnison</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>2.0</b>	<b>14.3</b>
<b>Jefferson</b>	<b>31</b>	<b>17</b>	<b>11</b>	<b>4</b>	<b>11</b>	<b>14.8</b>	<b>2.8</b>
<b>Kit Carson</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.6</b>	<b>7.5</b>
<b>La Plata</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>4</b>	<b>0</b>	<b>2.6</b>	<b>5.9</b>
<b>Larimer</b>	<b>17</b>	<b>6</b>	<b>8</b>	<b>7</b>	<b>3</b>	<b>8.2</b>	<b>3.2</b>
<b>Logan</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0.8</b>	<b>3.8</b>
<b>Mesa</b>	<b>5</b>	<b>12</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>4.8</b>	<b>4.1</b>
<b>Moffat</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.6</b>	<b>4.6</b>
<b>Montezuma</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Montrose</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>*</b>
<b>Morgan</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>*</b>
<b>Otero</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0.8</b>	<b>4.0</b>
<b>Park</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.6</b>	<b>4.1</b>
<b>Phillips</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Pitkin</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0.4</b>	<b>*</b>
<b>Prowers</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0.8</b>	<b>5.6</b>
<b>Pueblo</b>	<b>5</b>	<b>9</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>4.2</b>	<b>3.0</b>
<b>Rio Grande</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Routt</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0.4</b>	<b>*</b>
<b>Sagauche</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0.8</b>	<b>13.4</b>
<b>San Miguel</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Sedgwick</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Summit</b>	<b>3</b>	<b>10</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2.8</b>	<b>11.8</b>
<b>Teller</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0.4</b>	<b>*</b>
<b>Washington</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>*</b>
<b>Weld</b>	<b>9</b>	<b>6</b>	<b>11</b>	<b>10</b>	<b>7</b>	<b>8.6</b>	<b>4.7</b>
<b>TOTAL</b>	<b>341</b>	<b>206</b>	<b>212</b>	<b>88</b>	<b>75</b>	<b>184.4</b>	<b>4.3</b>

\*Average annual rates were not calculated for counties with <3 hepatitis A cases during the five-year period. Caution should be used when interpreting rates based on small numbers of cases. Rates were calculated using 2000 population figures from the 2002-based population projections, from the Demography Section, Colorado Division of Local Government.

## **Hepatitis B**

During 2002, there were 81 acute hepatitis B cases reported in Colorado, which represents a 19.0% decrease from the 100 cases reported in 2001. The incidence rate of acute hepatitis B cases in Colorado was 1.8/100,000 in 2002, compared to the United States incidence rate of 2.8/100,000 (7,996 cases). In Colorado, the majority of 2002 hepatitis B cases were 20-39 years of age (67.9%) and 80% of these were male. The male to female ratio was 4.4:1.0. Hepatitis B rates by age group and gender (Table 4) and county of residence (Table 5) are presented in the following two tables.

<b>Table 4. Reported Acute Hepatitis B Rates by Age Group &amp; Gender, Colorado, 2002</b>						
<b>Age Group (years)</b>	<b>Male</b>		<b>Female</b>		<b>Total</b>	
	<b>Cases</b>	<b>Rate</b>	<b>Cases</b>	<b>Rate</b>	<b>Cases</b>	<b>Rate</b>
< 15	0	0.0	0	0.0	0	0.0
15-19	1	0.6	0	0.0	1	0.3
20-29	22	6.5	7	2.3	29	4.5
30-39	22	6.0	4	1.2	26	3.7
40-49	13	3.5	3	0.8	16	2.2
50-59	4	1.5	0	0.0	4	0.7
≥ 60	4	1.5	1	0.3	5	0.8
<b>Total</b>	<b>66</b>	<b>2.9</b>	<b>15</b>	<b>0.7</b>	<b>81</b>	<b>1.8</b>

**Table 5. Reported Acute Hepatitis B Cases and Rates by County, Colorado  
1998 – 2002**

County	Number of Cases by Year of Report					Average Annual # of cases	Average Rate for 5 Years*
	1998	1999	2000	2001	2002		
<b>Adams</b>	8	10	8	12	4	8.4	2.3
<b>Alamosa</b>	0	0	0	1	0	0.2	*
<b>Arapahoe</b>	7	20	11	15	9	12.4	2.5
<b>Archuleta</b>	0	1	0	0	0	0.2	*
<b>Boulder</b>	5	3	5	0	4	3.4	1.2
<b>Broomfield**</b>	NA	NA	NA	0	1	0.2	*
<b>Clear Creek</b>	1	0	0	0	0	0.2	*
<b>Crowley</b>	0	0	2	1	0	0.6	10.9
<b>Denver</b>	30	33	34	34	33	32.8	5.9
<b>Douglas</b>	2	0	1	3	3	1.8	1.0
<b>Eagle</b>	1	1	0	1	0	0.6	1.4
<b>El Paso</b>	3	5	8	8	7	6.2	1.2
<b>Elbert</b>	0	1	0	0	0	0.2	*
<b>Fremont</b>	0	0	3	1	1	1.0	2.2
<b>Garfield</b>	2	0	0	0	0	0.4	*
<b>Gunnison</b>	1	0	0	0	1	0.4	*
<b>Huerfano</b>	0	0	0	0	1	0.2	*
<b>Jefferson</b>	14	7	9	10	6	9.2	1.7
<b>Larimer</b>	4	2	7	2	2	3.4	1.3
<b>Las Animas</b>	1	0	0	0	0	0.2	*
<b>Logan</b>	0	0	0	1	1	0.4	*
<b>Mesa</b>	4	0	0	1	3	1.6	1.4
<b>Mineral</b>	0	1	0	0	0	0.2	*
<b>Montezuma</b>	1	1	0	0	0	0.4	*
<b>Montrose</b>	0	0	1	0	0	0.2	*
<b>Morgan</b>	1	1	0	0	0	0.4	*
<b>Pitkin</b>	0	0	0	1	1	0.4	*
<b>Pueblo</b>	5	3	3	4	2	3.4	2.4
<b>Rio Grande</b>	1	1	0	0	0	0.4	*
<b>Routt</b>	1	0	0	1	0	0.4	*
<b>Teller</b>	0	1	0	0	0	0.2	*
<b>Unknown</b>	0	1	1	2	0	0.8	*
<b>Weld</b>	4	3	10	2	2	4.2	2.3
<b>TOTAL</b>	<b>96</b>	<b>95</b>	<b>103</b>	<b>100</b>	<b>81</b>	<b>95.0</b>	<b>2.2</b>

\*Average annual rates were not calculated for counties with <3 hepatitis B cases during the five-year period. Caution should be used when interpreting rates based on small numbers of cases. Rates were calculated using 2000 population figures from the 2002-based population projections, from the Demography Section, Colorado Division of Local Government.

\*\*Broomfield became a county 11/15/01.



## **Diphtheria**

No cases of diphtheria were reported in Colorado during 2002. The last case of diphtheria reported in Colorado was in 1985. In the United States, one diphtheria case was reported during 2002.

## **Tetanus**

No cases of tetanus were reported in Colorado during 2002. The last case reported was in 2001. The 2001 case was a Mesa county male in his early sixties with an underlying medical condition. In Colorado, the ten-year annual average (1993-2002) for tetanus was less than one case (0.8) per year. The incidence rate for the United States was 0.01/100,000 during 2002 (25 cases).

## **Mumps**

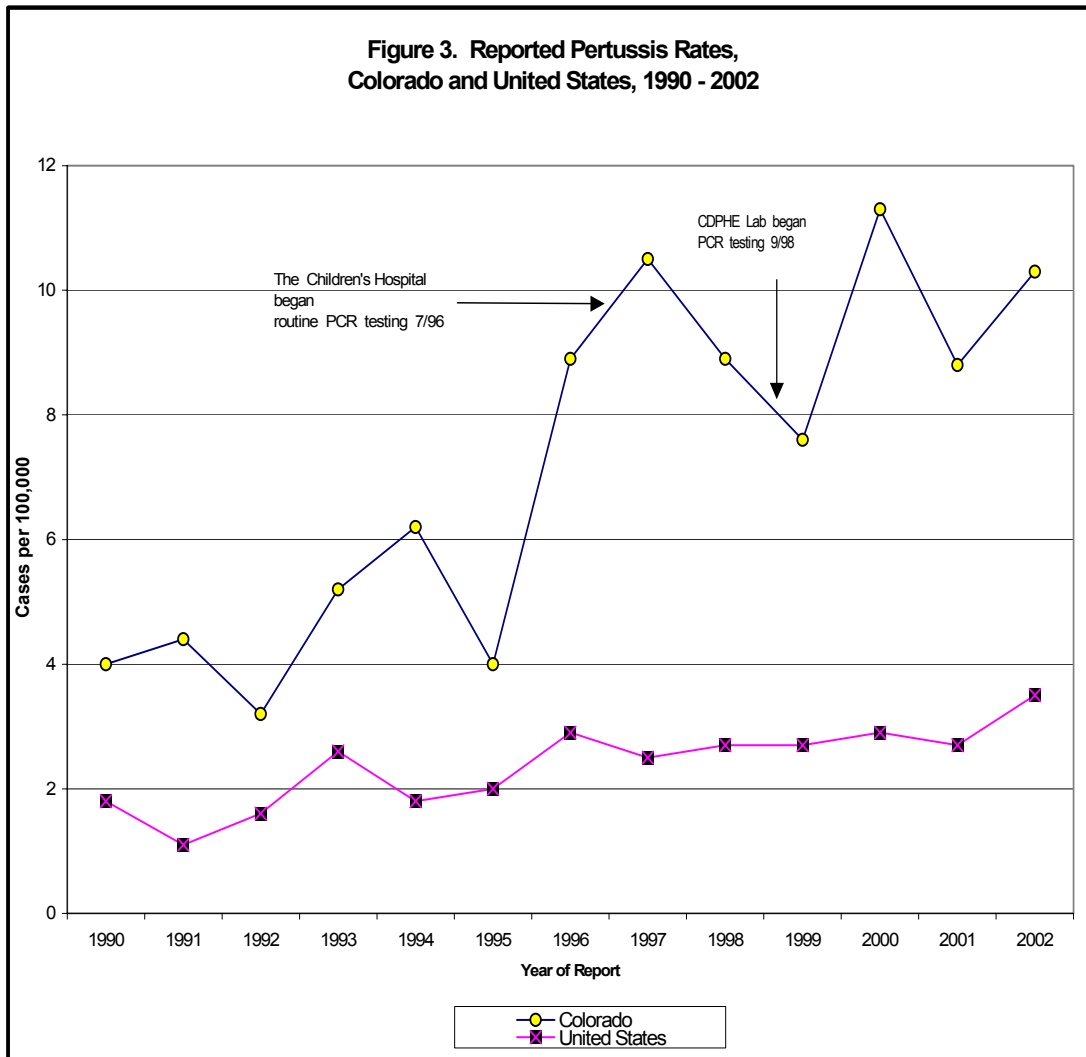
During 2002, two cases of laboratory-confirmed mumps were reported in Colorado; one adult and a 10- year-old male. The adult case was an Adams county female, who was exposed to mumps while visiting her sister in India. The 10-year-old male was from Jefferson county. Both cases had onset in April, however; there is no known connection between the two cases. The child had received 2 doses of mumps vaccine; the immunization status of the adult case is unknown.

The five-year annual average (1998-2002) for reported mumps cases in Colorado is 3.6 cases. The Colorado mumps incidence rate was 0.04/100,000 during 2002. Colorado's mumps incidence rate was less than the United States' incidence rate of 0.1/100,000 (270 cases).

## **Polio**

In 1994, the World Health Organization (WHO) certified the Western Hemisphere as free of wild polio virus. In the United States, the last case of polio caused by wild poliovirus was identified in 1979.

## Pertussis.



During 2002, there were 464 pertussis cases reported in Colorado. This represents a 19.3% increase from the 389 pertussis cases reported in 2001. Pertussis incidence rates for Colorado and the United States from 1990 through 2002 are shown in Figure 3 above.

Colorado's pertussis incidence rate was 10.3/100,000 in 2002, which was the 6<sup>th</sup> highest rate among the states. There were 9,771 pertussis cases reported in the United States during 2002, for an incidence rate of 3.4/100,000. Colorado's higher reported pertussis incidence rate, compared to the national rate, may be due to truly higher disease incidence in Colorado and /or the result of surveillance and detection artifacts (e.g. more complete case detection through epidemiologic investigations and testing of contacts, especially among adults; and more widespread use of PCR testing). Boulder County had the highest 5-year average annual rate of pertussis (25.9/100,000); however, the Boulder county rate for 2002 declined to 11.1/100,000 and their case numbers were only sixth highest in the state. Pertussis cases and rates by county are displayed in Table 6.

**Table 6. Reported Pertussis Cases and Rates by County, Colorado,  
1998 – 2002**

County	Number of Cases by Year of Report					Average Annual # cases	Average Rate for 5 Years*
	1998	1999	2000	2001	2002		
Adams	35	25	68	86	44	51.6	14.1
Alamosa	0	0	0	0	1	0.2	*
Arapahoe	23	30	35	46	74	41.6	8.5
Archuleta	0	0	2	0	0	0.4	*
Boulder	98	106	83	61	31	75.8	25.9
Broomfield**	NA	NA	NA	3**	10	NA	NA
Conejos	0	0	1	0	1	0.4	*
Crowley	1	1	1	0	0	0.6	10.9
Custer	0	1	0	0	0	0.2	*
Delta	0	2	0	0	6	1.6	5.7
Denver	41	35	96	49	84	61.0	11.0
Douglas	6	4	9	6	10	7.0	3.9
Eagle	0	1	0	0	0	0.2	*
El Paso	51	13	22	10	6	20.4	3.9
Elbert	0	1	0	0	5	1.2	5.9
Fremont	0	0	0	0	3	0.6	1.3
Garfield	4	6	0	0	0	2.0	4.5
Gilpin	0	0	0	0	1	0.2	*
Grand	0	1	0	0	0	0.2	*
Huerfano	0	0	0	0	1	0.2	*
Jefferson	63	46	103	71	122	81.0	15.3
La Plata	0	0	6	1	0	1.4	3.2
Lake	0	0	1	0	0	0.2	*
Larimer	5	10	17	25	35	18.4	7.3
Las Animas	0	0	0	2	0	0.4	*
Logan	7	1	0	0	0	1.6	7.7
Mesa	15	10	31	14	8	15.6	13.3
Montezuma	0	1	0	4	0	1.0	4.2
Montrose	1	0	0	1	0	0.4	*
Morgan	0	1	0	0	1	0.4	*
Park	2	0	1	0	0	0.6	4.1
Phillips	0	0	0	0	1	0.2	*
Pitkin	0	0	0	1	0	0.2	*
Pueblo	0	2	2	2	5	2.2	1.5
Rio Grande	0	0	3	5	1	1.8	14.5
Routt	0	0	0	0	2	0.4	*
Saguache	0	0	0	0	4	0.8	13.4
Sedgwick	0	1	0	0	0	0.2	*
Summit	0	0	0	0	1	0.2	*
Teller	0	3	0	1	0	0.8	3.8
Weld	5	10	7	0	7	5.8	3.2
Yuma	0	0	0	1	0	0.2	*
<b>TOTAL</b>	<b>357</b>	<b>311</b>	<b>488</b>	<b>389</b>	<b>464</b>	<b>401.8</b>	<b>9.3</b>

\* Average annual rates were not calculated for counties with < 3 pertussis cases during the five-year period. Caution should be used when interpreting rates based on small number of cases.

\*\* Broomfield became county 11/15/01.

Children less than one year of age had the highest incidence rate of pertussis during 2002 in Colorado (104.8/100,000) (Table 7) and in the United States (124.1/100,000 – data from the Centers for Disease Control and Prevention). In Colorado, the 10-14 year age group had the second highest rate (37.9/100,000) and comprised the highest proportion of cases (26.3%). Fifty-two percent (72) of pertussis cases among persons ages 10-19 were part of outbreaks. A pertussis outbreak is defined as two or more cases involving two or more households clustered in time and space where transmission is suspected to have occurred (e.g. a school). One case in an outbreak must be lab confirmed (PCR positive and meets case definition, or culture positive). There were 35 pertussis outbreaks reported in 2002, one of these outbreaks started in 2001 and one outbreak concluded in 2003. Of the 35 outbreaks, 17 involved schools or childcare settings. The outbreaks ranged in size from 2 cases to 20 cases (median=4 cases). The outbreak of 20 cases was connected to a small public school, which houses all grades in one building. The age distribution and rates for Colorado 2002 pertussis cases are displayed in Table 7.

<b>Table 7. Reported Cases and Rates of Pertussis by Age Group, Colorado, 2002</b>			
<b>Age Group (Years)</b>	<b>Cases</b>	<b>%</b>	<b>Rate</b>
<b>&lt;1</b>	71	15.3	104.8
<b>1 – 4</b>	57	12.3	22.5
<b>5 – 9</b>	44	9.5	14.1
<b>10 – 14</b>	122	26.3	37.9
<b>15 – 19</b>	71	15.3	21.1
<b>≥20</b>	99	21.3	3.1
<b>TOTAL</b>	<b>464</b>	<b>100.0</b>	<b>10.3</b>

The distribution of 2002 reported pertussis cases by symptoms and age group is displayed in Table 8. Pertussis cases less than 1 year of age had the highest percentage for each of the symptoms, followed closely by the 1-4 year age group. Post-tussive vomiting was reported by almost two-thirds (64.9%) of the cases during 2002.

<b>Table 8. Percentage of Reported Pertussis Cases by Symptoms and Age Group, Colorado, 2002</b>						
<b>SYMPTOMS *</b>	<b>Age Group (years)</b>					
	<b>&lt;1</b>	<b>1 – 4</b>	<b>5 – 9</b>	<b>10 – 19</b>	<b>≥ 20</b>	<b>ALL AGES</b>
Cough	100%	100%	100%	100%	100%	100%
Paroxysmal Cough**	98.6%	100%	97.7%	96.9%	100%	98.3%
Vomiting After Cough	77.5%	71.9%	72.7%	59.1%	59.6%	64.9%
Whoop	54.3%	53.6%	35.7%	38.3%	47.5%	44.0%

\* Symptoms were unknown for 7 cases, and not included in percentage calculations.

\*\* 8 cases did not have paroxysmal cough; 7 were outbreak cases and 1 was a 7-week-old infant with apnea and vomiting.

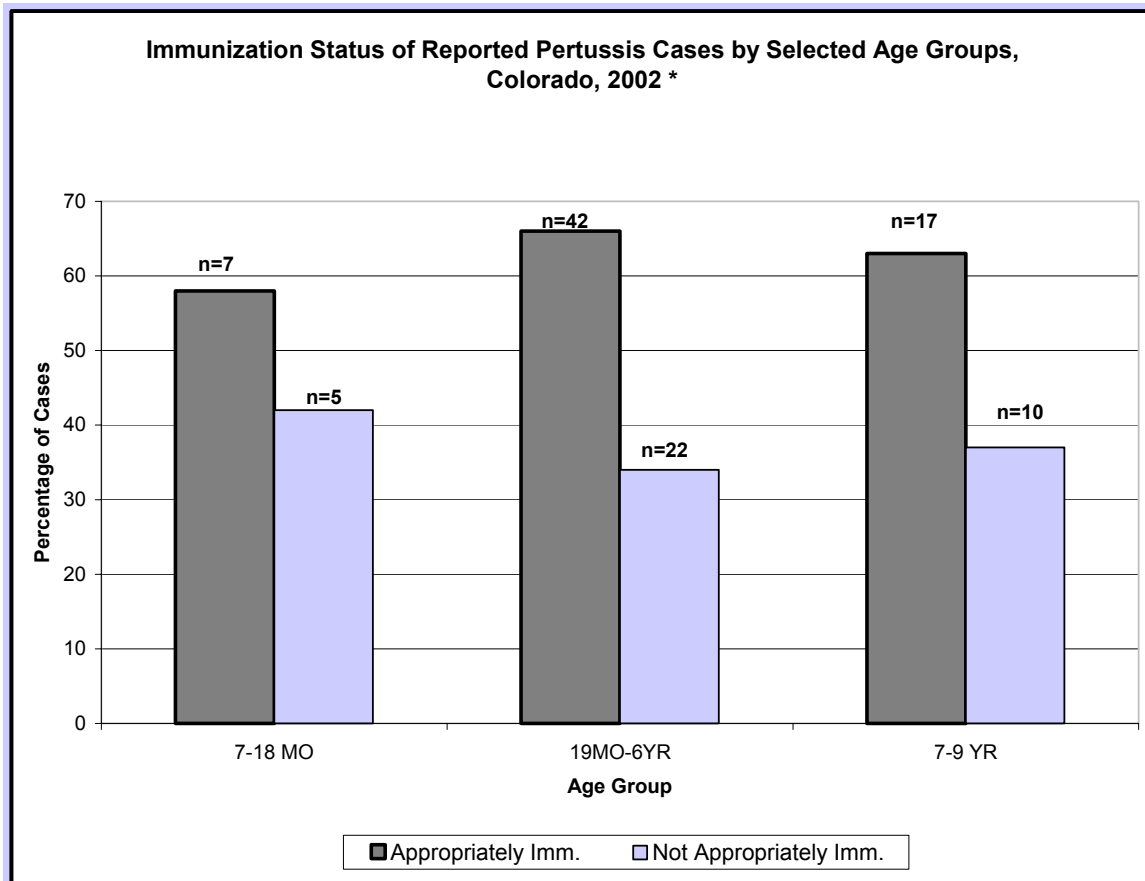
Pertussis cases 6 months through 6 years of age comprised 17.5% of all reported pertussis cases in Colorado and 21% of cases in the United States during 2002. In Colorado, 70.4% (57) of the cases in this age group had received at least three doses of pertussis vaccine (which is considered adequate to provide protective immunity), whereas, 46.1% in the United States had received at least three doses. Vaccination status was unknown for 35.5% (727) of the cases in this age group in the United States. Of the 464 pertussis cases reported in 2002, 62 (13.4%) were < 6 months of age and were not old enough to have routinely received three doses of vaccine. More detailed information regarding vaccination status of pertussis cases for selected age groups is located in Table 9.

<b>Table 9. Vaccination Status of Reported Pertussis Cases by Selected Age Groups, Colorado, 2002</b>				
<b>AGE GROUP</b>	<b>NUMBER OF PERTUSSIS VACCINE DOSES</b>			<b>Total Cases</b>
	<b>Unknown</b>	<b>0 – 2</b>	<b>3 +</b>	
	<b># CASES (%)</b>	<b># CASES (%)</b>	<b># CASES (%)</b>	
<b>6 – 11 MONTHS</b>	<b>0 (0.0%)</b>	<b>5 (55.6%)</b>	<b>4 (44.4%)</b>	<b>9</b>
<b>1 – 4 YEARS</b>	<b>4 (7.0%)</b>	<b>12 (21.1%)</b>	<b>41 (71.9%)</b>	<b>57</b>
<b>5 – 6 YEARS</b>	<b>0 (0.0%)</b>	<b>3 (20.0%)</b>	<b>12 (80.0%)</b>	<b>15</b>
<b>TOTAL</b>	<b>4 (4.9%)</b>	<b>20 (24.7%)</b>	<b>57 (70.4%)</b>	<b>81</b>

The immunization status of 2002 pertussis cases is shown in Figure 4 for children 7 months to 9 years of age. Appropriately immunized was defined using the Advisory Committee on

Immunization Practices (ACIP) recommendations for DTP/DTaP vaccination; three pertussis vaccinations by age 7 months, four pertussis vaccinations by age 19 months and five pertussis vaccinations by age 7 years or four pertussis vaccinations by age 7 years if the fourth dose was administered at age 4 or older. A minimum of three DTP/DTaP doses are needed to provide protection from pertussis, thus children less than 7 months of age were not included in the graph. Protection from pertussis vaccination wanes over time, therefore, children older than 9 years of age were also not included. As seen in the Figure 4, among children 7 months to 9 years of age, 64.1% of the cases occurred in age-appropriately immunized children.

Figure 4.



\* 6 cases (5.5%) with unknown immunization status were not included in the graph.

None of the appropriately immunized cases 7 months to 9 years of age were hospitalized for pertussis, whereas, 10.8% (4) of cases that were not appropriately immunized were hospitalized (one 7-month-old, two 19-month-olds, and one 9-year-old).

Colorado had no pertussis deaths reported in 2002. However, a 12-day-old infant from El Paso county moved to New Mexico and died from pertussis 8 days later. The infant's cough onset was 4 days prior to moving to New Mexico. The source of the infant's infection was the child's

mother, whose onset of cough occurred the day the child was born. During 2002, a total of 22 infants died from pertussis in the United States, 21 of these cases were < 4 months of age.

Fifteen Colorado pertussis cases in 2002 experienced complications; 14 (3.0 %) cases developed pneumonia and 1 case (0.2 %) case developed seizures. The case with seizures was an 18-year-old from Jefferson county with cerebral palsy. Pertussis complications are summarized in Table 10.

<b>Table 10. Reported Pertussis Complications, Colorado 1998-2002</b>						
<b>COMPLICATIONS</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>5 YEAR AVERAGE (1998-2002)</b>
<b>DEATH</b>	1	0	2	0	0	0.6
<b>ENCEPHALOPATHY</b>	0	0	0	0	0	0.0
<b>SEIZURES</b>	3	2	1	0	1	1.4
<b>PNEUMONIA*</b>	21	22	24	14	14	19.0

\* Confirmed by X-ray

During 2002, 9.7% (45 cases) of reported pertussis cases were hospitalized (Table 11). Cases < 6 months of age were most likely (54.8%) to be hospitalized. Hospitalization was infrequent (10/393=2.5%) among cases greater than 11 months of age, and none of the cases 10-19 years of age were hospitalized. Hospitalized pertussis cases had a mean hospital stay of 9.2 days, with a range of 1 to 30 days.

<b>Table 11. Reported Hospitalization Among Pertussis Cases, by Age Group, Colorado, 2002</b>			
<b>AGE GROUP</b>	<b># CASES</b>	<b># HOSPITALIZED</b>	<b>% HOSPITALIZED</b>
<b>&lt; 6 MONTHS</b>	62	34	54.8
<b>6 – 11 MONTHS</b>	9	1	11.1
<b>1 – 4 YEARS</b>	57	2	3.5
<b>5 – 9 YEARS</b>	44	1	2.3
<b>10 – 14 YEARS</b>	122	0	0.0
<b>15 – 19 YEARS</b>	71	0	0.0
<b>≥ 20 YEARS</b>	99	7	7.1
<b>TOTAL</b>	<b>464</b>	<b>45</b>	<b>9.7</b>

Of the 464 reported pertussis cases in 2002, a total of 431 (92.9 %) were classified as confirmed based on the CDC surveillance case definition. Laboratory confirmed pertussis cases are culture positive or PCR (polymerase chain reaction; a DNA amplification methodology) positive and meet the clinical case definition. In addition, cases that are epidemiologically linked to laboratory confirmed cases and meet the clinical case definition are classified as confirmed cases. There were 33 (7.1%) probable pertussis cases reported in 2002. Confirmed and probable pertussis cases are further classified in Table 12.

<b>Table 12. Classification of Reported Pertussis Cases, Colorado, 2002</b>		
<b>CASE CLASSIFICATION</b>	<b>NUMBER</b>	<b>%</b>
<b>Confirmed:</b> Culture &/or PCR Positive	<b>301</b>	<b>64.9</b>
<b>Confirmed:</b> Epidemiologically-linked to a Culture Positive Case &/or PCR Positive Case	<b>130</b>	<b>28.0</b>
<b>Probable:</b> DFA Positive Only	<b>3</b>	<b>0.6</b>
<b>Probable:</b> Physician Diagnosed Case	<b>16</b>	<b>3.4</b>
<b>Probable:</b> Serology Positive Only	<b>7</b>	<b>1.5</b>
<b>Probable:</b> Outbreak Situation*	<b>7</b>	<b>1.5</b>
<b>TOTAL</b>	<b>464</b>	<b>100.0</b>

\*In outbreak settings, including household exposures, a case may be defined as a cough illness lasting  $\geq 2$  weeks.

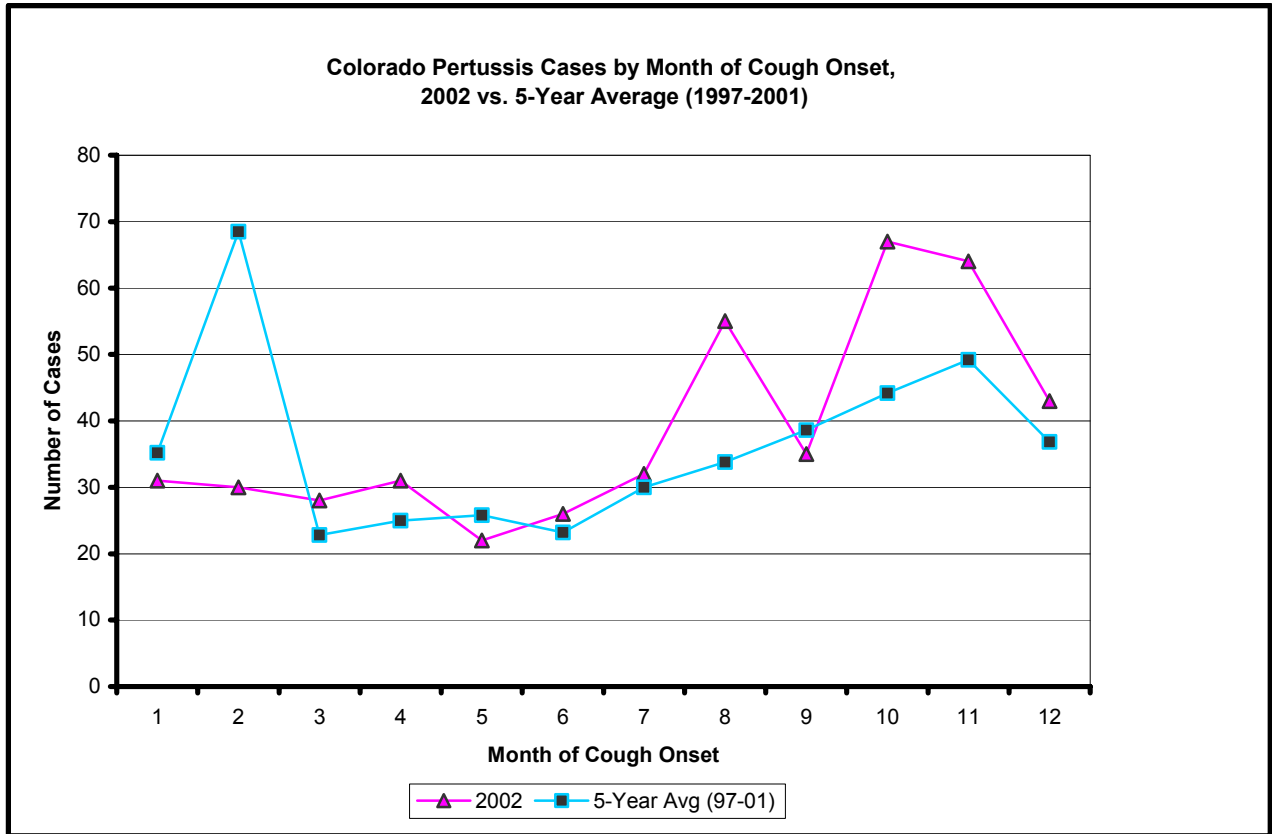
Nasopharyngeal specimens (334) or serology specimens (11) were obtained from 345 (74.4%) of reported pertussis cases during 2002. A total of 119 (25.6%) pertussis cases were not tested in 2002. Twenty-four individuals (24/345=7.0%) with negative test results and nine (9/345=2.6%) with indeterminate results were counted as pertussis cases because they met the clinical case definition and were physician diagnosed or epidemiologically related to another confirmed case. Serologic testing for pertussis is not recommended for diagnosis, as this test is not standardized and results are difficult to interpret.

Most laboratory confirmed pertussis cases in 2002 were PCR positive, as PCR is the most widely available type of testing in Colorado. Of the 301 laboratory confirmed cases during 2002; 292 (97.0%) were positive by PCR only, 4 (1.3%) were positive by culture only, and 5 (1.7%) were positive by both culture and PCR.



Pertussis incidence is seasonal (Figure 5). In 2002, there were more cases reported during the months of August, October and November than the 5-year average for these months, and less cases reported in February than the 5-year average for this month. Figure 5 displays pertussis cases by month of cough onset.

Figure 5.



**Haemophilus influenzae**

In 2002, there were 36 confirmed cases of invasive *Haemophilus influenzae* (H. flu) disease reported in Colorado. Only two H. flu serotype b (Hib) cases were reported during 2002, both cases were adult females. In the United States, there were 1,743 H. flu cases reported during 2002. Nationally, among children less than 5 years of age; 35 cases were Hib, 144 were non-serotype b, and 153 cases were unknown serotypes. During 2002, only 4 H. flu cases less than 5 years of age were reported in Colorado; 2 non-serotype b and 2 nontypeable. In 2002, the incidence rate for H. flu in the United States was 0.6/100,000, compared to the Colorado incidence rate of 0.8/100,000. The slightly higher incidence rate in Colorado may be due to active surveillance conducted by the Emerging Infections Program (EIP) in the Denver metropolitan area. In Colorado, adults 65 years of age and older had the highest rate of H. flu (3.0) during 2002. Table 13 displays *Haemophilus influenzae* case rates and case fatality by age group.

<b>Table 13. Reported Invasive <i>Haemophilus influenzae</i> Rates and Case Fatality by Age Group, Colorado, 2002</b>						
<b>AGE GROUP</b>	<b>Cases</b>				<b>Deaths</b>	
	<b>EIP* #</b>	<b>EIP rate**</b>	<b>State #</b>	<b>State rate**</b>	<b>State #</b>	<b>% of cases</b>
<b>&lt;=1</b>	3	4.3	3	2.2	0	0.0
<b>2-4</b>	0	0.0	1	0.5	0	0.0
<b>5-14</b>	2	0.6	2	0.3	0	0.0
<b>15-24</b>	0	0.0	1	0.2	1	100.0
<b>25-34</b>	3	0.9	4	0.6	0	0.0
<b>35-49</b>	3	0.6	6	0.5	0	0.0
<b>50-64</b>	4	1.2	6	0.9	1	16.6
<b>65+</b>	10	5.1	13	3.0	4	30.8
<b>Total</b>	<b>25</b>	<b>1.1</b>	<b>36</b>	<b>0.8</b>	<b>6</b>	<b>16.7</b>

\* Emerging Infections Program active surveillance in Denver Metropolitan Area: Adams, Arapahoe, Denver, Douglas, and Jefferson counties.

\*\* per 100,000 population

Additional invasive H. flu disease statistics are available on the Emerging Infections Program web page at [www.cdphe.state.co.us/dc/eip/eipmain.asp](http://www.cdphe.state.co.us/dc/eip/eipmain.asp).

## Meningococcal Disease

A total of 23 cases of invasive meningococcal disease were reported in Colorado during 2002, which represents a 30.3% decrease from the 33 cases reported in 2001. There were 1,814 cases of meningococcal disease reported in the United States during 2002. During 2002, the meningococcal disease incidence rate was 0.5/100,000 in Colorado and 0.6/100,000 in the United States. Children less than 2 years of age had the highest rate of meningococcal disease (4.5/100,000) during 2002 in Colorado. Table 14 displays meningococcal disease rates and case fatality by age group.

<b>Table 14. Reported Invasive Meningococcal Disease Rates and Case Fatality by Age Group, Colorado, 2002</b>						
<b>AGE GROUP</b>	<b>Cases</b>				<b>Deaths</b>	
	<b>EIP* #</b>	<b>EIP rate**</b>	<b>State #</b>	<b>State rate**</b>	<b>State #</b>	<b>% of cases</b>
<b>&lt;=1</b>	2	2.9	6	4.5	0	0.0
<b>2-4</b>	0	0.0	0	0.0	0	0.0
<b>5-14</b>	1	0.3	4	0.6	0	0.0
<b>15-24</b>	1	0.3	2	0.3	0	0.0
<b>25-34</b>	2	0.6	2	0.3	1	50.0
<b>35-49</b>	3	0.6	4	0.4	0	0.0
<b>50-64</b>	2	0.6	4	0.6	0	0.0
<b>65+</b>	0	0.0	1	0.2	0	0.0
<b>Total</b>	<b>11</b>	<b>0.5</b>	<b>23</b>	<b>0.5</b>	<b>1</b>	<b>4.3</b>

\* Emerging Infections Program active surveillance in Denver Metropolitan Area: Adams, Arapahoe, Denver, Douglas, and Jefferson counties.

\*\* per 100,000 population

The majority of meningococcal cases were either serogroup B (8) or serogroup Y (8). Cases are displayed by serogroup in Table 15.

<b>Table 15. Reported Invasive Meningococcal Disease by Serogroup, Colorado, 2002</b>		
<b>Serotype</b>	<b>Cases</b>	<b>% of cases</b>
<b>B</b>	8	34.8
<b>C</b>	5	21.7
<b>Y</b>	8	34.8
<b>Not Groupable</b>	2	8.7
<b>Total</b>	<b>23</b>	<b>100.0</b>

Additional invasive meningococcal disease statistics are available on the Emerging Infections Program web page at [www.cdphe.state.co.us/dc/eip/eipmain.asp](http://www.cdphe.state.co.us/dc/eip/eipmain.asp).

## Pneumococcal Disease

In Colorado, 392 cases of invasive pneumococcal disease (IPD) were reported during 2002 for an incidence rate of 8.7/100,000. Invasive pneumococcal disease has been reportable in the 5-county Denver metropolitan area since July 2000 and statewide since November 30, 2001. Of the 392 IPD cases reported, 296 (75.5%) were from the 5-county Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) and 96 (24.5%) were from outside the Denver metro area. In Colorado, the age groups having the highest rates of pneumococcal disease during 2002 were adults  $\geq 80$  years of age (41.3) and infants less than 1 year of age (39.8). Table 16 displays IPD incidence rates and fatality by age group.

<b>Table 16. Reported Invasive Pneumococcal Disease Rates and Case Fatality, by Age Group, Colorado, 2002</b>						
<b>AGE GROUP</b>	<b>Cases</b>				<b>Deaths<sup>§</sup></b>	
	<b>EIP* Number</b>	<b>EIP Rate</b>	<b>State Number</b>	<b>State Rate</b>	<b>State #</b>	<b>% of Cases</b>
<1	18	50.9	27	39.8	1	3.7
1-4	17	13.2	31	12.2	0	0.0
5-9	3	1.9	7	2.2	0	0.0
10-14	1	0.6	1	0.3	0	0.0
15-19	6	3.9	9	2.7	0	0.0
20-39	42	6.3	48	3.5	5	11.4
40-59	104	16.8	137	10.7	15	13.4
60-79	72	32.6	87	18.1	8	11.3
80+	33	66.6	45	41.3	9	23.7
<b>Total</b>	<b>296</b>	<b>13.5</b>	<b>392</b>	<b>8.7</b>	<b>38</b>	<b>11.3</b>

\* Emerging Infections Program active surveillance in Denver Metropolitan area; Adams, Arapahoe, Denver Douglas and Jefferson counties.  
<sup>§</sup>Survival status is unknown for 55 cases from outside the 5-county Denver metro area. These 55 cases were excluded from the case fatality calculations.

During 2002, 34 children less than five years of age from the Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) were diagnosed with IPD. Pneumococcal isolates from 30 (88.2%) of these cases were serotyped at the CDC. Of the 30 isolates, 13 (43.3%) were serotypes included in the pneumococcal conjugate vaccine. Serotype 19F, which is a vaccine serotype, was the most frequently reported serotype overall (20.0%), as well as, among vaccinated cases (36.4%). All of the apparent “vaccine failures” (n=4) were serotype 19F: two infants two months of age each had received one dose, one child 12 months of age had received three doses, and one child three years of age had received two doses after their first birthday. Of the remaining nine cases due to vaccine serotypes, five (38.5%) were unvaccinated prior to illness onset and four (30.8%) had “unknown vaccine” histories. Cases are shown by serotype and vaccination history in Table 17.

**Table 17. Invasive Pneumococcal Cases Less Than 5 Years of Age With Onset January 1 – December 31, 2002, by Serotype, Denver Metro Area<sup>¶</sup>, Colorado**

Serotype	Number of Cases	Vaccinated Prior to Onset (1+ doses)	Not Vaccinated Prior to Onset	Unknown Vaccine History
<b>4*</b>	1	0	1	0
<b>6B*</b>	1	0	0	1
<b>9V*</b>	3	0	2	1
<b>14*</b>	1	0	1	0
<b>18C*</b>	1	0	0	1
<b>19F*</b>	6	4 <sup>§</sup>	1	1
<b>23F*</b>	0	0	0	0
<b>SUBTOTAL*</b>	13	4 <sup>§</sup>	5	4
<b>Not in Vaccine</b>	17	7	4	6
<b>Not typed</b>	4	1	1	2
<b>TOTAL</b>	34	12	10	12

<sup>¶</sup> Adams, Arapahoe, Denver, Douglas, and Jefferson counties.

\* Serotype is included in the Pneumococcal Conjugate Vaccine.

<sup>§</sup> Two 2-month-olds each with 1 dose, one 12-month-old with 3 doses, & one 3-year-old with 2 doses after their first birthday.

Overall, vaccination status was unknown for 35.3% of the 2002 Denver area IPD cases less than five years of age. Slightly more than half, (52.9%) of these cases were less than one year of age. IPD cases are displayed by age group and vaccination status in Table 18.

<b>Table 18. Invasive Pneumococcal Cases Less Than 5 Years of Age,            With Onset January 1 – December 31, 2002, by Age and Vaccination Status            Denver Metro Area*, Colorado</b>							
AGE	# Doses of Pneumococcal Conjugate Vaccine Prior to Onset						TOTAL
	0	1	2	3	4	Unknown	
<2 Months	0	0	0	0	0	0	0
2-3 Months	1	2	0	0	0	1	4
4-5 Months	0	1	0	0	0	1	2
6-7 Months	0	2	0	1	0	1	4
8-11 Months	2	2	0	1	0	3	8
1 Year	3	0	0	1	1	1	6
2 Years	3	0	0	0	0	2	5
3 Years	0	0	1	0	0	2	3
4 Years	1	0	0	0	0	1	2
<b>TOTAL</b>	<b>10</b>	<b>7</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>12</b>	<b>34</b>

\* Adams, Arapahoe, Denver, Douglas, and Jefferson counties.

*Streptococcus pneumoniae* can cause meningitis, bacteremia (blood-stream infection) and pneumonia. Additional invasive pneumococcal disease statistics are available on the web at [www.cdphe.state.co.us/dc/eip/eipmain.asp](http://www.cdphe.state.co.us/dc/eip/eipmain.asp).