

Vaccine Preventable Diseases in Colorado

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

Surveillance Report: 2005



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January 2007

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Introduction

This report highlights 2005 surveillance data for vaccine preventable diseases in Colorado. Colorado rates in this report were calculated as cases per 100,000 population using 2005-based population final estimates from the Demography Section, Colorado Division of Local Government. National rates were calculated using 2005 United States Census Bureau population estimates for July 1, 2005. Vaccine preventable diseases reported in Colorado during 2001-2005 are summarized below in Table 1.

Table 1. Reported Cases of Vaccine Preventable Diseases, Colorado*, 2001 - 2005

Report Year	Measles	Mumps	Rubella	Tetanus	Pertussis	Invasive Meningococcal Disease	Invasive Pneumococcal Disease**	Invasive H. flu	Hepatitis A	Acute Hepatitis B
2001	0	3	0	1	389	33	317	38	88	100
2002	0	2	0	0	464	23	391	36	75	81
2003	0	1	1	0	368	27	366	39	59	80
2004	1	3	0	3	1185	15	332	44	51	59
2005	0	6	0	1	1383	19	422	42	49	63

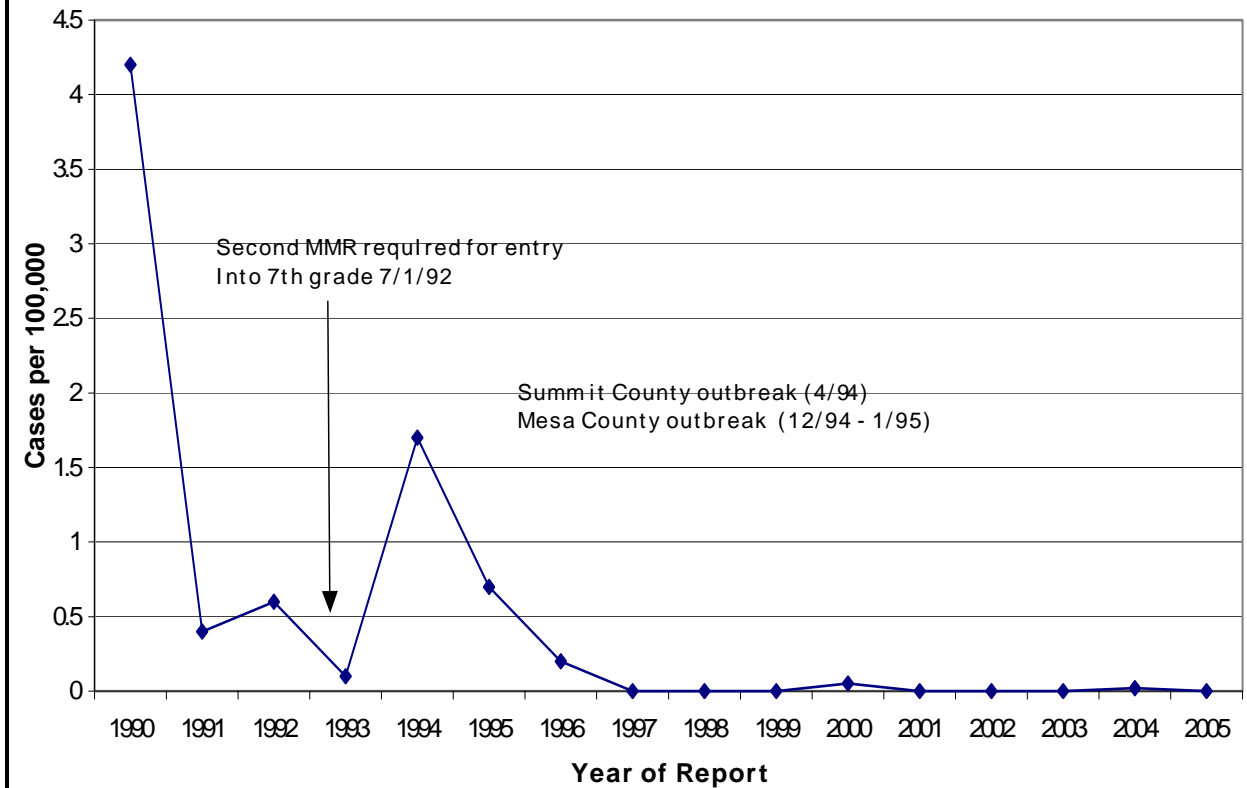
* No congenital rubella, diphtheria, or polio cases were reported during 2001 – 2005.

**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; therefore, 2000 data are derived from 6 months of reporting.

Measles

There were no measles cases reported in Colorado during 2005. During the last five years, 2001 – 2005, one measles case was reported in 2004. The measles incidence rate in Colorado has decreased from 1.7/100,000 in 1994 to 0 in 2005. There were 66 measles cases reported in the United States during 2005 for an incidence rate of 0.02 /100,000. Figure 1 shows Colorado measles rates from 1990 – 2005.

Figure 1. Reported Measles Rates, Colorado, 1990-2005

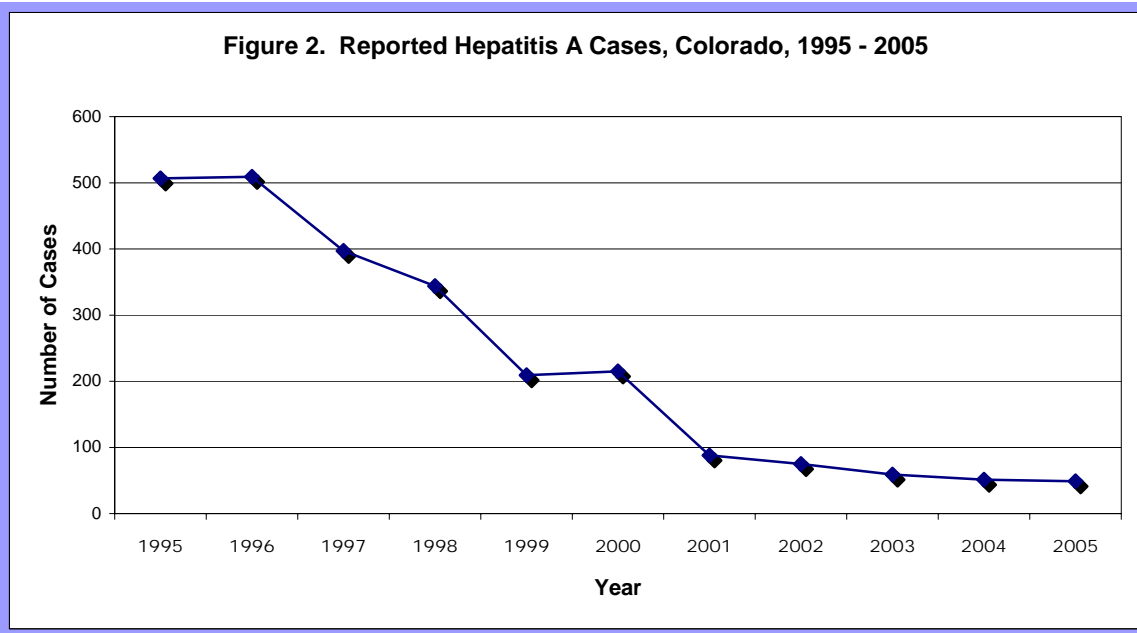


Rubella

There were no rubella cases reported in Colorado during 2005. The ten-year annual average (1995-2004) for rubella in Colorado was less than one case (0.7) per year. There were 11 rubella cases reported in the United States during 2005, for an incidence rate of 0.004/100,000. As reported in MMWR (March 25, 2005) an independent panel unanimously agreed in October 2004 that rubella is no longer endemic in the United States.

Hepatitis A

A total of 49 hepatitis A cases were reported in Colorado during 2005, which represents a 4.1% decrease from the 51 cases reported in 2004. Reported hepatitis A cases have decreased steadily since 1995 (Figure 2) in Colorado with an incidence rate of 1.0/100,000 in 2005. The United States 2005 hepatitis A incidence rate was 1.5/100,000, based on 4,488 reported cases.



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.

Table 2. Reported Hepatitis A Cases and Rates by Age Group & Gender, Colorado, 2005						
Age Group (years)	Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
0-1	1	1.4	0	0.0	1	0.7
2-4	0	0.0	2	2.0	2	1.0
5-9	2	1.2	1	0.6	3	1.0
10-14	1	0.6	2	1.3	3	0.9
15-19	2	1.1	3	1.8	5	1.4
20-39	7	1.0	11	1.7	18	1.3
40+	8	0.8	9	0.9	17	0.8
Total	21	0.9	28	1.2	49	1.0

**Table 3. Reported Hepatitis A Cases and Rates by County, Colorado
2001 – 2005**

County	Number of Cases by Year of Report					Average Annual # of cases	Average Rate for 5 Years*
	2001	2002	2003	2004	2005		
Adams	12	12	5	1	5	7.0	1.8
Alamosa	0	0	1	0	1	0.4	*
Arapahoe	7	7	9	3	7	6.6	1.3
Archuleta	1	0	0	0	0	0.2	*
Boulder	3	3	5	5	5	4.2	1.5
Broomfield**	0**	0	0	1	0	NA	NA
Chaffee	0	0	0	2	0	0.4	*
Delta	0	1	0	1	0	0.4	*
Denver	23	14	7	3	9	11.2	2.0
Douglas	1	2	3	4	7	3.4	1.5
Eagle	8	2	2	0	1	2.6	5.5
El Paso	1	3	4	6	6	4.0	0.7
Elbert	0	0	0	1	0	0.2	*
Fremont	0	2	0	0	0	0.4	*
Garfield	1	0	8	1	2	2.4	5.0
Gilpin	0	1	0	0	0	0.2	*
Grand	0	0	1	0	0	0.2	*
Gunnison	0	0	2	1	0	0.6	*
Jefferson	4	11	2	1	2	4.0	0.8
La Plata	4	0	0	2	0	1.2	2.6
Larimer	7	3	2	1	1	2.8	1.1
Logan	1	0	0	0	0	0.2	*
Mesa	1	2	0	1	0	0.8	*
Moffat	0	0	0	4	0	0.8	*
Montrose	0	0	1	0	0	0.2	*
Morgan	0	0	2	2	1	0.8	2.8
Otero	0	0	1	0	0	0.2	*
Pitkin	1	0	0	1	0	0.2	*
Pueblo	3	2	0	1	0	1.2	0.8
Routt	0	2	1	6	0	1.8	8.4
San Miguel	0	0	1	0	0	0.2	*
Teller	0	1	0	0	0	0.2	*
Weld	10	7	4	3	2	5.2	2.5
TOTAL	88	75	59	51	49	64.4	1.4

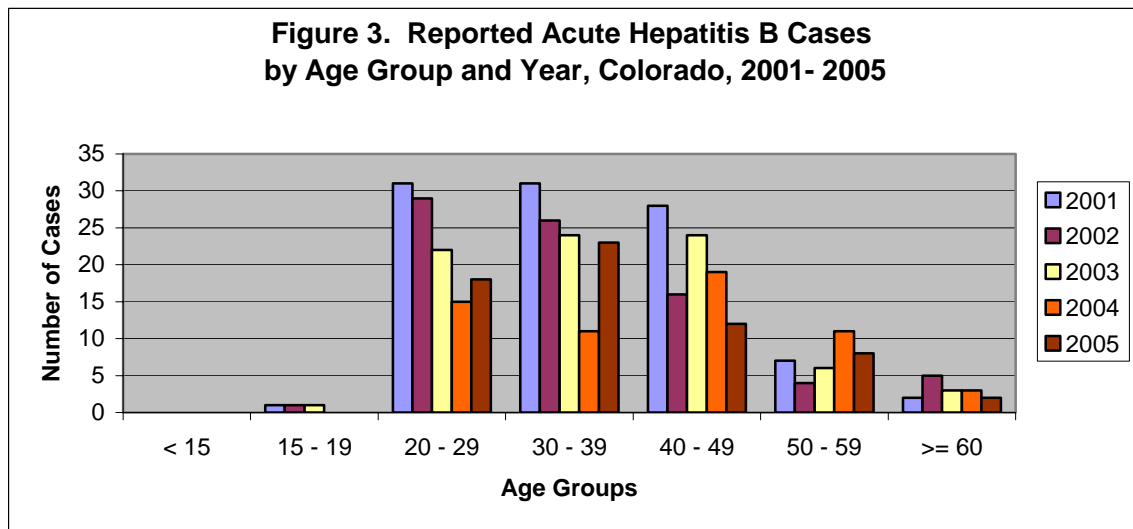
* Average annual rates were not calculated for counties with <5 hepatitis A cases during the five-year period. Caution should be used when interpreting rates based on small numbers of cases. Rates were calculated using 2003 population figures from the 2005-based population projections, from the Demography Section, Colorado Division of Local Government.

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

Acute Hepatitis B

During 2005, there were 63 reported cases of acute hepatitis B in Colorado, which represents a 6.8 % increase compared to the 59 cases reported in 2004. The incidence rate of acute hepatitis B in Colorado was 1.3/100,000 in 2005, compared to the United States incidence rate of 1.7/100,000 (5,119 cases). In Colorado, 84% of 2005 hepatitis B cases were 20-49 years of age; of these, 83% were male. Hepatitis B data are displayed by rates, age group, and county of residence in Table 4, Figure 3, and Table 5.

Table 4. Reported Acute Hepatitis B Cases and Rates by Age Group & Gender, Colorado, 2005						
Age Group (years)	Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
< 15	0	0.0	0	0.0	0	0.0
15-19	0	0.0	0	0.0	0	0.0
20-29	14	4.0	4	1.3	18	2.7
30-39	21	5.7	2	0.6	23	3.3
40-49	9	2.4	3	0.8	12	1.6
50-59	3	1.0	5	1.6	8	1.3
≥ 60	1	0.3	1	0.3	2	0.3
Total	48	2.0	15	0.6	63	1.3



**Table 5. Reported Acute Hepatitis B Cases and Rates by County, Colorado
2001 – 2005**

County	Number of Cases by Year of Report					Average Annual # of cases	Average Rate for 5 Years*
	2001	2002	2003	2004	2005		
Adams	12	4	6	4	10	7.2	1.9
Alamosa	1	0	0	0	0	0.2	*
Arapahoe	15	9	13	5	5	9.4	1.8
Boulder	0	4	1	4	3	2.4	0.8
Broomfield**	0**	1	0	0	0	NA	NA
Crowley	1	0	0	0	0	0.2	*
Chaffee	0	0	0	1	1	0.4	*
Denver	34	33	29	17	23	27.2	4.8
Dolores	0	0	0	1	0	0.2	*
Douglas	3	3	1	0	1	1.6	0.7
Eagle	1	0	1	0	0	0.4	*
El Paso	8	7	12	8	4	7.8	1.4
Fremont	1	1	0	0	1	0.6	*
Garfield	0	0	0	0	1	0.2	*
Gunnison	0	1	0	0	0	0.2	*
Huerfano	0	1	0	0	0	0.2	*
Jefferson	10	6	4	6	4	6.0	1.1
La Plata	0	0	0	1	0	0.2	*
Larimer	2	2	3	4	4	3.0	1.1
Las Animas	0	0	1	0	1	0.4	*
Logan	1	1	0	1	0	0.6	*
Mesa	1	3	0	0	0	0.8	*
Montezuma	0	0	0	1	0	0.2	*
Morgan	0	0	1	0	1	0.4	*
Pitkin	1	1	0	0	0	0.4	*
Pueblo	4	2	4	3	2	3.0	2.0
Rio Grande	0	0	2	0	0	0.4	*
Routt	1	0	0	0	0	0.2	*
Saguache	0	0	0	1	0	0.2	*
Unknown	2	0	0	0	0	0.4	NA
Weld	2	2	2	1	2	1.8	0.9
TOTAL	100	81	80	59	63	77.0	1.7

* Average annual rates were not calculated for counties with <5 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 2003 population figures from the 2005-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 or the United States during 2005. The last case of diphtheria reported in Colorado was in 1985.

Tetanus

There was one case of tetanus reported in Colorado during 2005. Tetanus is based on clinical diagnosis, as there is no specific laboratory test to confirm the illness. The reported case was a young adult female from Mesa County, who claimed she was vaccinated as a child. There was no obvious source of infection, however, the case admitted to occasionally reusing needles for diabetic insulin injections and had recently received a tattoo.

In Colorado, the ten-year annual average (1995-2004) for tetanus was less than one case (0.9) per year. The 2005 tetanus incidence rate for Colorado was 0.02/100,000, compared with the national incidence rate of 0.009/100,000 (27 cases).

Mumps

During 2005, six confirmed mumps cases were reported in Colorado. Only 2 of the cases were laboratory confirmed (mumps IgM antibody positive), and the remaining 4 cases were not tested, but were epidemiologically linked.

A mother and her 2 young adult sons from El Paso County had mumps in February and March. In February one son with a history of 2 MMR vaccinations had mumps symptoms, and his older brother with an unknown immunization history developed symptoms in early March. Neither case was reported until their unimmunized mother tested mumps IgM positive in March. The source of infection for the first son is unknown.

Also in February and March, 2 brothers from Weld County were reported as clinically diagnosed with mumps. The children were unimmunized and neither was tested for mumps.

In October an unimmunized adult female from Adams County tested IgM positive for mumps. Her source of infection was unknown, however, she worked at a community college.

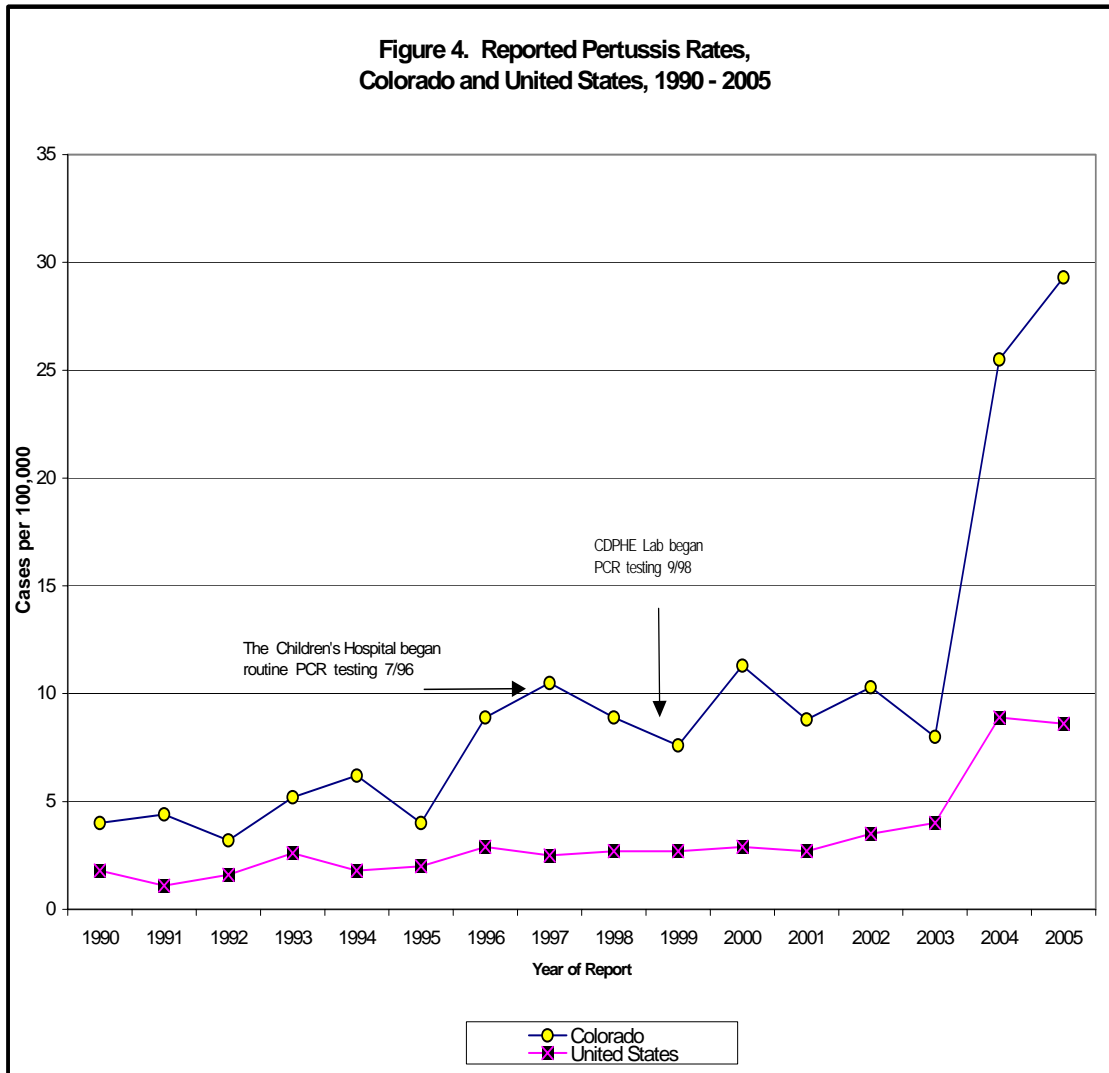
The five-year annual average (2000-2004) for reported mumps cases in Colorado is 2 cases. During 2005, there were 314 mumps cases reported in the United States. The mumps incidence rates in Colorado and the United States were the same during 2005 at 0.1/100,000.

Polio

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

Pertussis

During 2005, there were 1,383 pertussis cases reported in Colorado. This represented a 16.7% increase from the 1,185 pertussis cases reported in 2004. Pertussis incidence rates for Colorado and the United States from 1990 through 2005 are shown in Figure 4 below. Note the dramatic 222% increase in reported pertussis cases from 2003 to 2004. The United States pertussis incidence rate also increased significantly from 2003 to 2004.



Colorado's pertussis incidence rate was 29.3/100,000 in 2005, which was the 4th highest rate among the states. There were 25,616 pertussis cases reported in the United States during 2005, for an incidence rate of 8.6/100,000. 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). Pertussis cases and rates by county are displayed in Table 6.

**Table 6. Reported Pertussis Cases and Rates by County, Colorado,
2001 – 2005**

County	Number of Cases by Year of Report					Average Annual # cases	Average Rate for 5 Years*
	2001	2002	2003	2004	2005		
Adams	86	44	24	128	119	80.2	20.8
Alamosa	0	1	0	6	1	1.6	10.3
Arapahoe	46	74	59	102	169	90.0	17.3
Archuleta	0	0	0	0	4	0.8	*
Bent	0	0	0	1	0	0.2	*
Boulder	61	31	47	175	115	85.8	30.3
Broomfield**	3**	10	6	23	16	NA	NA
Chaffee	0	0	2	1	9	2.4	14.3
Cheyenne	0	0	1	1	7	1.8	82.1
Clear Creek	0	0	4	3	5	2.4	24.9
Conejos	0	1	0	3	0	0.8	*
Costilla	0	0	1	2	0	0.6	*
Delta	0	6	1	26	5	7.6	25.6
Denver	49	84	39	78	175	85.0	15.0
Dolores	0	0	0	0	2	0.4	*
Douglas	6	10	27	43	55	28.2	12.5
Eagle	0	0	1	1	2	0.8	*
El Paso	10	6	15	35	62	25.6	4.7
Elbert	0	5	6	1	12	4.8	21.6
Fremont	0	3	1	3	5	2.4	5.0
Garfield	0	0	0	1	15	3.2	6.6
Gilpin	0	1	0	5	4	2.0	40.7
Grand	0	0	21	10	7	7.6	55.4
Huerfano	0	1	0	0	0	0.2	*
Jefferson	71	122	67	160	287	141.4	26.7
Kiowa	0	0	1	0	0	0.2	*
Kit Carson	0	0	0	1	0	0.2	*

Table 6. continues on next page

Table 6. (Continued) Pertussis Cases and Rates by County, Colorado, 2001-2005

County	Number of Cases by Year of Report					Average Annual # cases	Average Rate for 5 Years*
	2001	2002	2003	2004	2005		
La Plata	1	0	3	37	32	14.6	31.2
Lake	0	0	0	0	1	0.2	*
Larimer	25	35	8	140	80	57.6	21.7
Las Animas	2	0	0	0	0	0.4	*
Logan	0	0	0	2	21	4.6	21.0
Mesa	14	8	3	112	81	43.6	34.9
Moffat	0	0	0	2	0	0.4	*
Montezuma	4	0	0	0	12	3.2	13.0
Montrose	1	0	1	1	3	1.2	3.3
Morgan	0	1	0	4	1	1.2	4.3
Otero	0	0	0	19	1	4.0	20.3
Ouray	0	0	0	4	0	0.8	19.9
Park	0	0	0	0	2	0.4	*
Phillips	0	1	0	0	0	0.2	*
Pitkin	1	0	0	3	1	1.0	6.1
Prowers	0	0	0	3	11	2.8	19.8
Pueblo	2	5	2	27	17	10.6	7.1
Rio Blanco	0	0	0	0	4	0.8	*
Rio Grande	5	1	6	2	4	3.6	27.9
Routt	0	2	0	1	1	0.8	*
Saguache	0	4	1	0	0	1.0	15.7
San Miguel	0	0	0	1	0	0.2	*
Sedgwick	0	0	2	0	0	0.4	*
Summit	0	1	1	0	0	0.4	*
Teller	1	0	0	0	10	2.2	9.9
Washington	0	0	0	0	2	0.4	*
Weld	0	7	18	18	23	13.2	6.3
Yuma	1	0	0	0	0	0.2	*
TOTAL	389	464	368	1185	1383	757.8	16.5

* Average annual rates were not calculated for counties with < 5 pertussis cases during the five-year period. Caution should be used when interpreting rates based on small number of cases. Rates were calculated using 2003 population figures from the 2005-based population projections from the Demography Section, Colorado Division of Local Government.

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

Children less than one year of age had the highest incidence rate of pertussis during 2005 in Colorado (179.3/100,000) (Table 7) and in the United States 160.8/100,000 (US data from CDC's "Pertussis Surveillance Report, Weeks 1-52, 2005"). In Colorado, the 10-14 year age group had the second highest rate (98.6/100,000), followed by the 15-19 year age group (68.0/100,000). The age distribution and rates for 2005 pertussis cases are displayed in Table 7.

Table 7. Reported Cases and Rates of Pertussis by Age Group, Colorado, 2005			
Age Group (Years)	Cases	%	Rate
<1	124	9.0	179.3
1 – 4	99	7.2	35.6
5 – 9	116	8.4	36.5
10 – 14	320	23.1	98.6
15 – 19	237	17.1	68.0
≥ 20	487	35.2	14.4
TOTAL	1383	100	29.3

The distribution of 2005 reported pertussis cases by symptoms and age group is displayed in Table 8. Pertussis cases less than 5 years of age had the highest proportions with reported post-tussive vomiting and whooping symptoms. All cases reported paroxysmal cough and half (50.2%) of the 2005 pertussis cases reported post-tussive vomiting.

Table 8. Percentage of Reported Pertussis Cases by Symptoms and Age Group, Colorado, 2005						
SYMPTOMS	Age Group (years)					
	<1	1 – 4	5 – 9	10 – 19	≥ 20	ALL AGES
Cough	100	100	100	100	100	100
Paroxysmal Cough	100	100	100	99.1	100	99.6 ⁺
Vomiting After Cough	64.5	65.7	56.9	49.0	43.1	50.2 Unk* (2.2)
Whoop	45.2	49.5	37.9	31.2	38.4	36.9 Unk* (3.6)

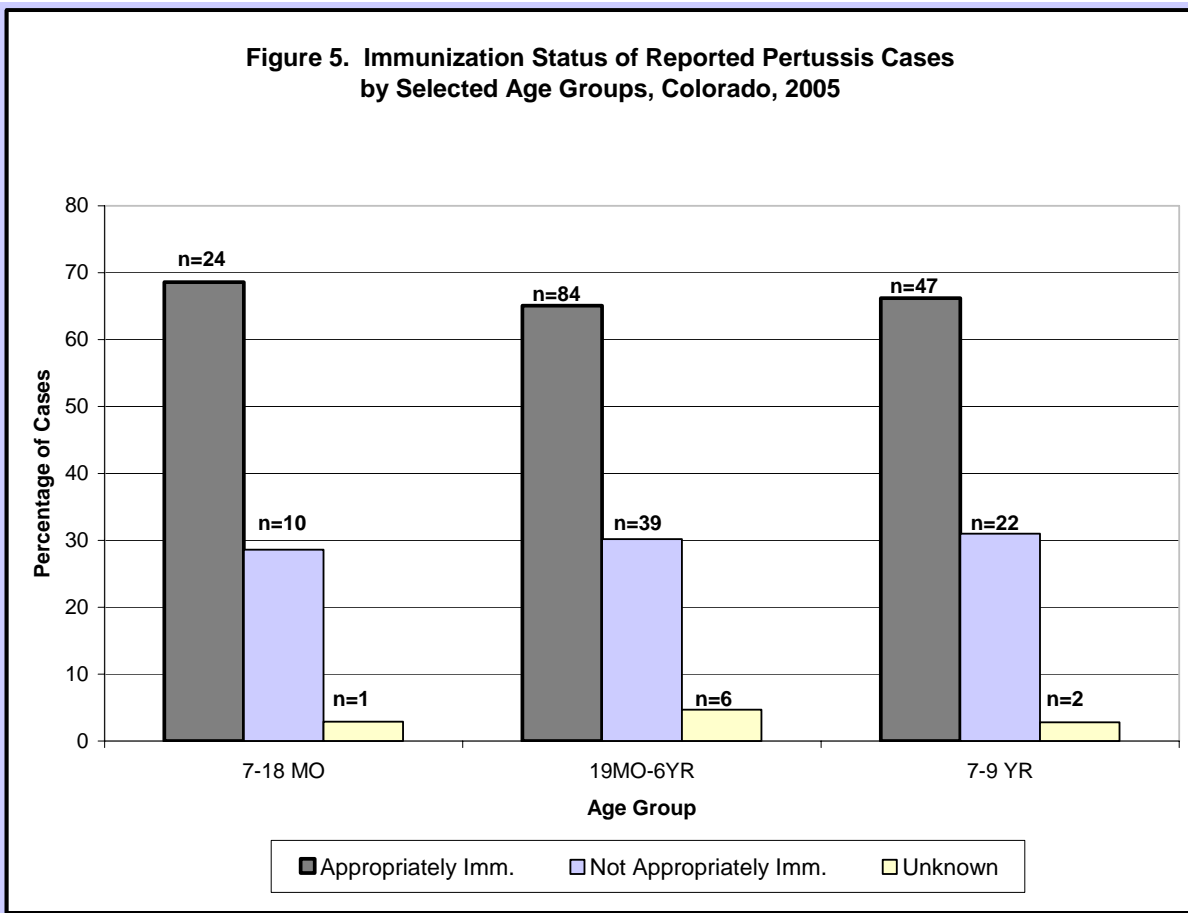
* Unk= Unknown.
⁺ 5 cases did not have a paroxysmal coughs, these cases were PCR+ and part of a widespread outbreak.

Pertussis cases 7 months through 9 years of age comprised 17.0% (235 cases) of all reported pertussis cases in Colorado during 2005. Of the cases in this age group, 71.5% (168) had received at least three doses of pertussis vaccine (which is considered adequate to provide protective immunity for most children). Of the 1,383 pertussis cases reported in 2005, 104 (7.5%) were < 7 months of age and, therefore, 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 provided in Table 9.

Table 9. Immunization Status of Reported Pertussis Cases by Selected Age Groups, Colorado, 2005				
AGE GROUP	NUMBER OF PERTUSSIS VACCINE DOSES			Total Cases
	Unknown	0 – 2	3 +	
	# CASES (%)	# CASES (%)	# CASES (%)	
7 - 18 MONTHS	1 (2.9%)	10 (28.6%)	24 (68.6%)	35
19 MONTHS – 6 YEARS	6 (4.7%)	32 (24.8%)	91 (70.5%)	129
7 - 9 YEARS	2 (2.8%)	16 (22.5%)	53 (74.6%)	71
TOTAL	9 (3.8%)	58 (24.7%)	168 (71.5%)	235

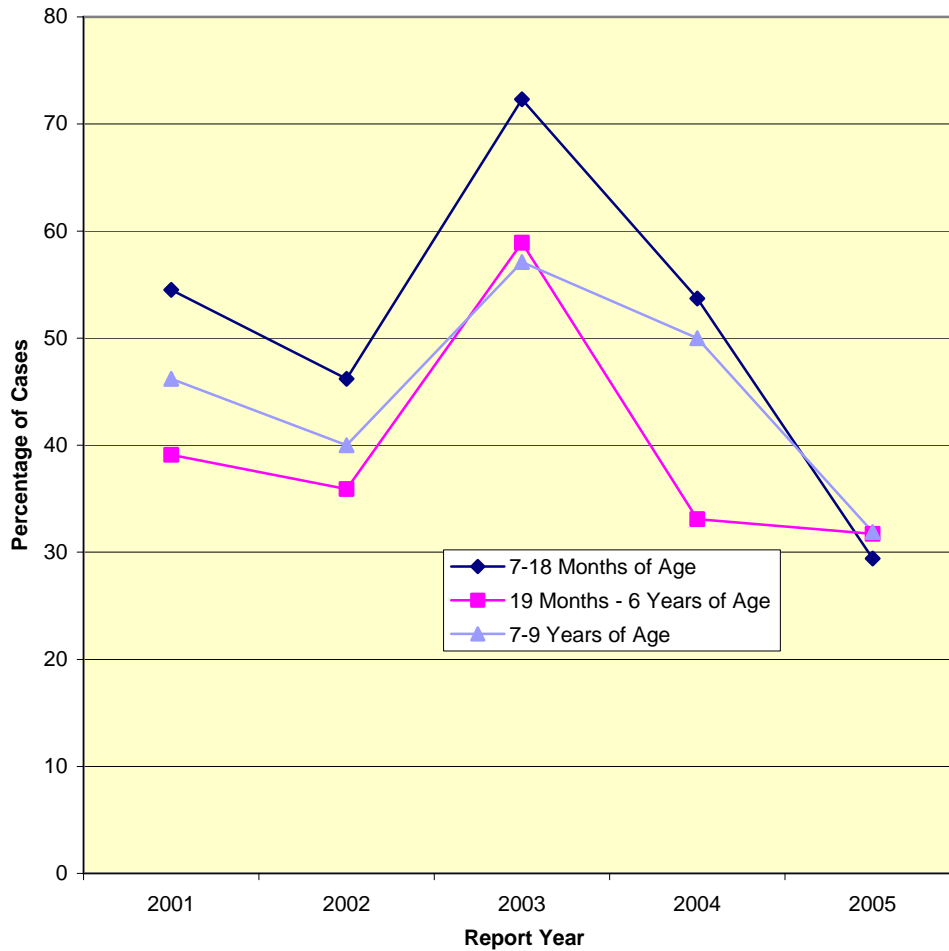
The immunization status of 2005 pertussis cases is shown in Figure 5 for children 7 months to 9 years of age. Appropriately immunized was defined using the Advisory Committee on Immunization Practices (ACIP) recommendations for DTP/DTaP vaccination; three pertussis vaccinations by age 7 months, four 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 5, among children 7 months to 9 years of age, 30.2% of the cases occurred in children who were not appropriately immunized for their age.

Figure 5. Immunization Status of Reported Pertussis Cases by Selected Age Groups, Colorado, 2005



Trends in the proportion of pertussis cases 7 months to nine years of age who were not age-appropriately immunized are shown in Figure 6. During the past five years (2001 – 2005) the highest percentage of pertussis cases that were not age-appropriately immunized (60%) occurred in 2003. In Colorado, DTaP vaccinations were delayed due to a nationwide DTaP vaccine shortage from March 2001 through February 2003. The shortage resulted in the Colorado Board of Health suspending the school immunization requirement for the 4th and 5th doses of DTaP from April 2001 through September 2004. The same ACIP definition of appropriately immunized was used in Figures 5 and 6.

Figure 6. Percentage of Reported Pertussis Cases Not Appropriately Immunized for Age by Selected Age Groups, Colorado, 2001 - 2005*



* 28 cases with unknown immunization status were not included in the graph (2001-five, 2002-six, 2003-one, 2004-seven & 2005-nine)

There were two pertussis deaths reported in Colorado during 2005. Both cases were unimmunized 1-month-old Hispanic infants with pneumonia. Both cases had been born prematurely. In the United States, a total of 38 individuals died from pertussis during 2005; 35 (92.1%) of these cases were < 3 months of age. In the United States, 50% of the pertussis deaths with reported ethnicity were Hispanic during 2005.

Only 1 Colorado case was reported as having seizures and encephalopathy associated with pertussis during 2005, an 11-year-old unimmunized male who was hospitalized. A total of 33 (2.4%) pertussis cases were diagnosed with pneumonia during 2005. Pertussis complications are summarized in Table 10.

Table 10. Reported Pertussis Complications, Colorado, 2001-2005						
COMPLICATIONS	2001	2002	2003	2004	2005	5 YEAR AVERAGE (2001-2005)
DEATH	0	0	0	1	2	0.6
ENCEPHALOPATHY	0	0	0	0	1	0.2
SEIZURES	0	1	3	0	1	1.0
PNEUMONIA*	14	14	6	30	33	19.4

* Confirmed by X-ray

During 2005, a total of 5.2% (72 cases) of reported pertussis cases were hospitalized (Table 11). Cases less than 6 months of age were most likely (52.5%) to be hospitalized. Hospitalization was infrequent (19/1282=1.5%) among cases greater than 6 months of age, and none of the cases 5-9 and 15-19 years of age were hospitalized. Among hospitalized pertussis cases, the median hospital stay was 4 days (range = 1 – 26 days).

Table 11. Reported Hospitalizations Among Pertussis Cases by Age Group, Colorado, 2005			
AGE GROUP	# HOSPITALIZED	# CASES	% HOSPITALIZED
< 6 MONTHS	53	101	52.5
6 – 11 MONTHS	2	23	8.7
1 – 4 YEARS	3	99	3.0
5 – 9 YEARS	0	116	0
10 – 14 YEARS	2	320	0.6
15 – 19 YEARS	0	237	0
≥ 20 YEARS	12	487	2.5
TOTAL	72	1383	5.2

Of the 1,383 reported pertussis cases in 2005, a total of 1,080 (78.1 %) were classified as confirmed based on the CDC surveillance case definition. Confirmed pertussis cases are those which are culture positive or PCR (polymerase chain reaction; a DNA amplification methodology) positive and meet the clinical case definition. [Clinical case definition is a cough illness lasting at least 14 days with one of the following: paroxysms of coughing, inspiratory “whoop”, or post-tussive vomiting, without other apparent cause (as reported by a health care professional.)] In addition, cases that are epidemiologically linked to laboratory confirmed cases and meet the clinical case definition are classified as confirmed cases. There were 303 (21.9%) probable pertussis cases reported in 2005. Included in the probable case count were 25 cases that were PCR positive and not reinterviewed to determine whether they met the case definition due to the large increase in pertussis reports. These 25 cases were classified as “Probable: Widespread Outbreak/PCR Positive/ Unknown Cough Duration.” Otherwise, probable cases met the clinical case definition for pertussis. Confirmed and probable pertussis cases are further classified in Table 12.

Table 12. Classification of Reported Pertussis Cases, Colorado, 2005		
CASE CLASSIFICATION	NUMBER	%
Confirmed: Culture &/or PCR Positive	835	60.4
Confirmed: Epidemiologically–linked to a Culture Positive Case &/or PCR Positive Case	245	17.7
Probable: DFA* Positive Only	1	0.07
Probable: Physician Diagnosed Case	117	8.5
Probable: Serology Positive Only	146	10.6
Probable: Outbreak Situation**	14	1.0
Probable: Widespread Outbreak/PCR Positive/ Unknown Cough Duration	25	1.8
TOTAL	1383	100

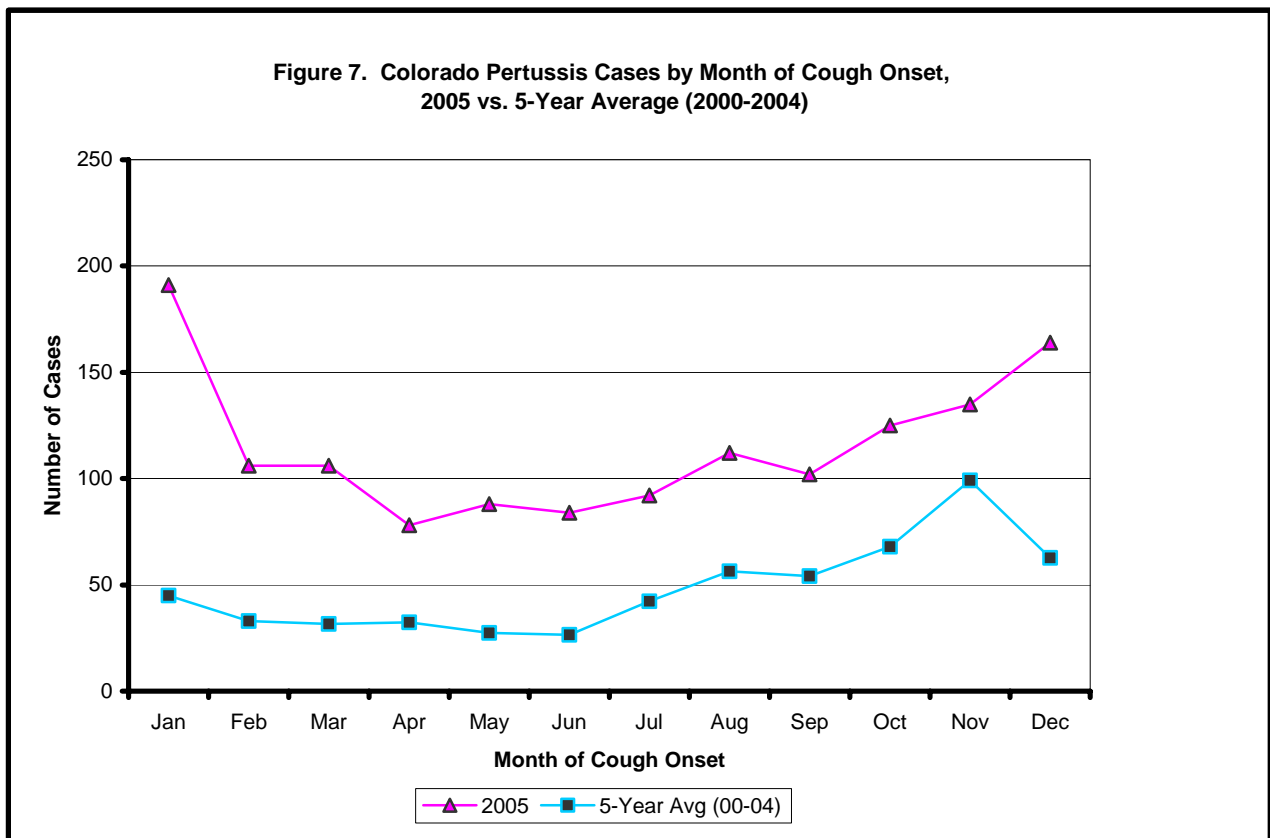
* DFA = Direct fluorescent antibody.

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

Nasopharyngeal or serum specimens were obtained from 1,126 (81.4%) of reported pertussis cases during 2005. A total of 257 (18.6%) pertussis cases were not tested. Some individuals with negative test results or 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 or part of an outbreak. Serologic testing for pertussis is not recommended for diagnosis, as these tests are not standardized and results are difficult to interpret.

PCR is the most widely available type of pertussis testing in Colorado. Of the 1,022 positive pertussis lab results reported in 2005; 865 were PCR positive, 153 were IgA and/or IgM positive serologic tests, 3 were culture positive, and 1 was DFA positive. Some cases were tested with more than 1 type of pertussis test.

Pertussis cases are reported throughout the year in Colorado (Figure 7), although, incidence is typically greatest during August through December, based on the 5 year average. In 2005, there were substantially more cases reported during each month than the 5-year average.



Haemophilus influenzae

In 2005, there were 42 cases of invasive *Haemophilus influenzae* (H. flu) disease reported in Colorado, which represented a 4.5% decrease over the 44 cases reported in 2004. There were 10 H. flu cases < 5 years of age reported during 2005; 2 were serotype a, 1 was serotype b, 1 was serotype e, and 6 were non-typeable. Two H. flu serotype b (Hib) cases were reported in Colorado during 2005, a 3-year-old and 7-year-old. Both children were fully immunized, and neither had underlying medical conditions.

In the United States, there were 2,304 H. flu cases reported during 2005. Nationally, among children less than 5 years of age, there were 9 cases of Hib, 135 cases of non-serotype b, and 217 cases of unknown serotypes. The 2005 incidence rate for H. flu in the United States was 0.8/100,000, compared to Colorado’s incidence rate of 0.9/100,000. 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.

Of the 42 H. flu cases reported during 2005, 28 (66.7%) were from the 5-county Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) and 14 (33.3%) were from outside the Denver metro area. In Colorado, children < 1 year of age had the highest rate of H. flu (8.7/1000,000), followed by adults 80 years of age and older (4.4/100,00). A total of 6 (14.3%) H. flu infections were fatal during 2005. Table 13 displays *Haemophilus influenzae* case rates and case fatality by age group.

Table 13. Reported Invasive <i>Haemophilus influenzae</i> Cases, Rates and Case Fatality by Age Group, Colorado, 2005				
AGE GROUP	CASES	RATE*	DEATHS	
			#	% OF CASES
< 1	6	8.7	3	50.0
1 – 4	4	1.4	0	0
5 – 9	1	0.3	0	0
10 – 14	0	0	0	0
15 – 19	1	0.3	0	0
20 – 39	5	0.4	0	0
40 – 59	7	0.5	1	14.3
60 – 79	13	2.4	1	4.4
80+	5	4.4	1	20.0
TOTAL	42	0.9	6	14.3

* 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/index.html.

Meningococcal Disease

A total of 19 cases of meningococcal disease were reported in Colorado during 2005, which represented a 26.7% increase from the 15 cases reported in 2004. There were 1,245 cases of meningococcal disease reported in the United States during 2005, which was an 8.5% decrease from the number of cases reported in 2004 (1,361 cases). During 2005, the meningococcal disease incidence rates for Colorado and the United States were the same, 0.4/100,000. Of the 19 cases reported in Colorado, 10 (52.6%) were from the 5-county Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) and 9 (47.4%) were from outside the Denver metro area. Children less than 1 year of age had the highest rate of meningococcal disease (4.3/100,000) in Colorado. A total of 3 (15.8%) meningococcal infections were fatal in 2005. Table 14 displays meningococcal disease rates and case fatality by age group.

Table 14. Reported Meningococcal Disease Cases, Rates and Case Fatality by Age Group, Colorado, 2005				
AGE GROUP	CASES	RATE*	DEATHS	
			#	% OF CASES
< 1	3	4.3	1	33.3
1 – 4	5	1.8	1	20.0
5 – 9	1	0.3	0	0
10 – 14	0	0	0	0
15 – 19	3	0.9	0	0
20 – 39	3	0.2	1	33.3
40 – 59	3	0.2	0	0
60 – 79	0	0	0	0
80 +	1	0.9	0	0
TOTAL	19	0.4	3	15.3

* Per 100,000 population

The majority of Colorado meningococcal disease cases reported in 2005 were serogroup B (31.6%). The meningococcal vaccine is effective against serogroups A, C, Y, and W-135, but not serogroup B. Cases are displayed by serogroup in Table 15 below.

Table 15. Reported Cases of Meningococcal Disease by Serogroup, Colorado, 2005		
Serogroup	Cases	% of cases
B	6	31.6
C	1	5.3
Y	5	26.3
W-135	2	10.5
Not Groupable	4	21.1
Unknown	1	5.3
Total	19	100

Additional invasive meningococcal disease statistics are available on the Emerging Infections Program web page at www.cdphe.state.co.us/dc/eip/index.html.

Pneumococcal Disease

In Colorado, 421 cases of invasive pneumococcal disease (IPD) were reported during 2005, which represented a 28.6% increase over the 332 cases reported in 2004. Invasive pneumococcal disease has been reportable in the 5-county Denver metropolitan area since July 2000 and statewide since November 30, 2001. Of the 421 IPD cases reported, 280 (66.5%) were from the 5-county Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) and 141 (33.5%) were from outside the Denver metro area. In Colorado, the age groups having the highest rates of pneumococcal disease during 2005 were adults \geq 80 years of age (35.0/100,000) and infants less than 1 year of age (23.1/100,000). During 2005, 7.8% (33 cases) of reported invasive pneumococcal infections were fatal. Table 16 displays IPD incidence rates and fatality by age group.

**Table 16. Reported Invasive Pneumococcal Disease Cases,
Rates and Case Fatality by Age Group, Colorado, 2005**

AGE GROUP	CASES	RATE*	DEATHS	
			#	% OF CASES
< 1	16	23.1	1	6.2
1 – 4	35	12.6	0	0
5 – 9	6	1.9	1	16.7
10 – 14	5	1.5	0	0
15 – 19	7	2.0	0	0
20 – 39	48	3.5	1	2.1
40 – 59	150	10.9	5	3.3
60 – 79	114	21.3	19	16.7
80 +	40	35.0	6	15.0
TOTAL	421	8.9	33	7.8

*Per 100,000 population

There was a 46.2% increase in reported IPD cases among children less than five years of age in the Denver metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties) from 2004 (26 cases) to 2005 (37 cases). Pneumococcal isolates from 27 (72.9%) of the 2005 cases less than 5 years of age were serotyped at CDC. Of these 27 isolates, 11.1% (3) were vaccine serotypes (i.e., serotypes included in the pneumococcal conjugate vaccine), whereas, during 2004, 19.2% of isolates serotyped from children less than five years of age were vaccine serotypes.

The most frequently reported serotype (37%) in children less than 5 years of age from the Denver Metro area was serotype 19A, which is not a vaccine serotype. The increase in serotype 19A has been documented in other states participating in the CDC-funded Emerging Infections Program during 2003-2005. All 3 cases caused by vaccine serotypes had received at least one dose of pneumococcal vaccine. Cases are shown by serotype and vaccination history in Table 17.

Table 17. Reported Invasive Pneumococcal Disease Cases Less Than 5 Years of Age by Vaccine Serotype, Denver Metro Area[¶], Colorado, 2005

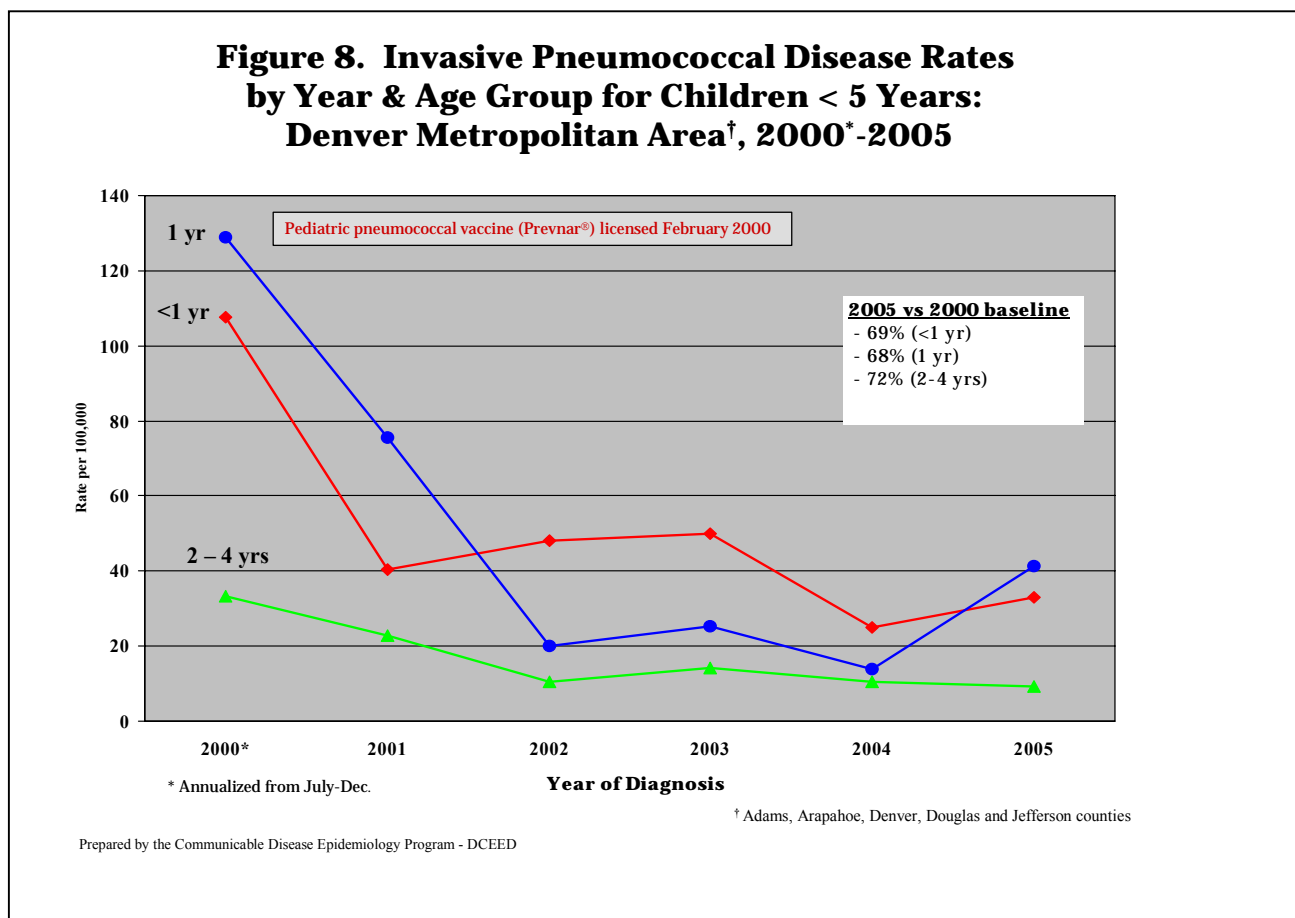
Serotype	Number of Cases	Vaccinated Prior to Onset (1+ doses)	Not Vaccinated Prior to Onset	Unknown Vaccine History
4*	0	0	0	0
6B*	0	0	0	0
9V*	0	0	0	0
14*	0	0	0	0
18C*	1	1	0	0
19F*	2	2	0	0
23F*	0	0	0	0
SUBTOTAL*	3	3	0	0
Not in Vaccine	24	18	2	4
Not typed	10	6	0	4
TOTAL	37	27	2	8

[¶] Adams, Arapahoe, Denver, Douglas, and Jefferson counties.

* Serotype is included in the Pneumococcal Conjugate Vaccine.

Overall, vaccination status was unknown for 21.6% of the 2005 Denver area IPD cases less than five years of age. The majority of cases with unknown vaccine status (87.5%) were 1-4 years of age.

The pneumococcal conjugate vaccine (Prevnar[®]) was licensed in the United States in early 2000. The dramatic decline in the IPD rate in Denver metro area children < 5 years of age from 2000 to 2005 is shown in Figure 8.



Invasive pneumococcal disease can manifest as 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/index.html.

Varicella

During 2005, a total of 1,797 varicella cases were reported from 52 counties, compared to 2,040 cases reported in 2004 (which represents 11 months of reporting). The incidence rate of varicella cases in Colorado was 38.1/100,000 in 2005. Half (50.0%) of the reported varicella cases in 2005 were 5 to 9 years of age and this age group had the highest rate 282.1/100,000. In 2004 this age group also had the largest percentage and highest rate with 54.3 % of the cases and a rate of 355.1/100,000. The age distribution and rates for 2005 varicella cases are displayed in Table 18.

During the 2004 - 2005 school year varicella vaccine was required for all children 18 months or older attending childcare and students in kindergarten through 4th grade. Each school year another grade is added until 2013 when all children will be required to have varicella vaccine to attend school.

Table 18. Reported Varicella Cases and Rates by Age Group, Colorado, 2005			
Age Group (Years)	Cases	%	Rate
<1	44	2.4	63.6
1 – 4	234	13.0	84.2
5 – 9	897	50.0	282.1
10 – 14	524	29.2	161.5
15 – 19	47	2.6	13.5
20 – 39	41	2.3	3.0
≥40	10	0.6	0.7
TOTAL	1797	100	38.1

During 2005, only 0.7% (13 cases) of reported varicella cases were hospitalized. Of these 13 cases, 7 cases were <10 years of age, 3 were 10-18 years of age, and the remaining 3 cases were >18 years of age. The severity of varicella disease and vaccine status is summarized in Table 19. In 2005, a total of 59.5 % (1,069) were vaccinated. Vaccinated cases were more likely to have mild disease (<50 lesions), whereas, unimmunized cases were more likely to have moderate or severe disease (≥ 50 lesions). Of the 1,069 cases that received varicella vaccine, only 5 cases had documentation of 2 doses of vaccine. There were no varicella deaths reported during 2005.

Table 19. Reported Varicella Cases by Severity of Disease and Vaccine Status, Colorado, 2005

Severity of Disease	≥ 1 Dose of Vaccine	Unimmunized	Unknown Immunization Status	Total Cases
	# Cases (%)	# Cases (%)	# Cases (%)	#Cases (%)
< 50 Lesions	652 (61.0)	183 (34.3)	46 (23.6)	881 (49.0)
50 – 500 Lesions	258 (24.1)	255 (47.8)	39 (20.0)	552 (30.7)
> 500 Lesions	7 (0.7)	17 (3.2)	2 (1.0)	26 (1.4)
Unknown	152 (14.2)	78 (14.6)	108 (55.4)	338 (18.8)
TOTAL	1069 (100)	533 (100)	195 (100)	1797 (100)