

Vaccine Preventable Diseases in Colorado: 2019 Surveillance Report

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Introduction

This report is published by the Vaccine Preventable Disease Unit, part of the Communicable Disease Branch within the division of Disease Control and Public Health Response of Colorado Department of Public Health and Environment (CDPHE). The tables and graphs in this report summarize 2019 surveillance data for confirmed and probable cases of select vaccine preventable diseases (VPD) in Colorado. This report also describes the burden and distribution of VPDs and trends over time.

Surveillance

Colorado Board of Health regulations require health care providers and laboratories to report cases of diphtheria, invasive *Haemophilus influenzae*, measles, meningococcal disease, mumps, pertussis, invasive pneumococcal disease, polio, rubella, tetanus, and varicella, among others, to CDPHE. Health care providers include physicians, nurses, physician assistants, or other persons knowing of or suspecting a case (including but not limited to coroners, infection preventionists, school nurses, or licensed daycare providers). Laboratories include Colorado laboratories, out-of-state laboratories that maintain a physical presence in Colorado, and in-state laboratories which send specimens to out-of-state referral laboratories.

CDPHE receives funding to conduct enhanced statewide surveillance for *Haemophilus influenzae*, meningococcal disease, mumps, and varicella. In addition, CDPHE receives funding to conduct active, population-based surveillance for invasive *Haemophilus influenzae*, invasive pneumococcal disease, pertussis and several other invasive bacterial infections in the five county metro area (Adams, Arapahoe, Denver, Douglas, and Jefferson) as part of the Emerging Infections Program Active Bacterial Core Surveillance System. Enhanced surveillance involves additional data collection and validation.

All cases are to be reported with patient's name, date of birth, sex, race, ethnicity, and address (including city and county), as well as name and address of responsible physician or other health care provider in order to locate the patient for follow up.

Data Sources

The data that form the basis of this report are principally reports of VPD among people living in Colorado at the time their illness was reported to CDPHE. Most cases of VPD are reported via electronic laboratory reporting (ELR) and are triaged by the Integrated Disease Reporting Program (IDRP) at CDPHE and entered into the Colorado Electronic Disease Reporting System (CEDRS). Other reports are called or faxed to CDPHE or a local public health agency (LPHA). The VPD unit also requests death certificate matches from the CDPHE Office of Vital Statistics twice a year to detect VPD-related deaths not reported by providers or laboratories.

Laboratory and clinical data are obtained from health care providers directly, from review of medical records, or from patient interviews. Data on immunization history are obtained from the Colorado Immunization Information System and from cases and providers.

Colorado rates were calculated as cases per 100,000 population using final 2019 and population estimates from the Demography Section, Colorado Division of Local Government, Colorado Department of Local Affairs.

School-required vaccines

Colorado law ([Board of Health rule 6 CCR 1009-2](#)) requires all students attending Colorado schools and licensed child cares to be vaccinated against certain diseases, unless an exemption is filed. In addition to the vaccines required for school entry, there are several vaccines recommended by the ACIP that provide protection against other diseases. These include meningococcal, hepatitis A, rotavirus, human papillomavirus, and influenza.

Vaccines Required to Enter Child Care	Vaccines Required to Enter school (K-12)
Hepatitis B	Hepatitis B
Diphtheria, tetanus, pertussis (DTaP)	Diphtheria, tetanus, pertussis (DTaP)
<i>Haemophilus influenzae type b</i> (Hib)	<i>Haemophilus influenzae type b</i> (Hib)
Inactivated poliovirus (IPV)	Inactivated poliovirus (IPV)
Pneumococcal conjugate (PCV13) or polysaccharide(PPSV23)	Measles, mumps, rubella (MMR)
Measles, mumps, rubella (MMR)	Varicella (chickenpox)*
Varicella (chickenpox)	Tetanus, diphtheria, pertussis (Tdap)**

*Students four through six years of age are required to have their final doses of DTaP, IPV, MMR and Varicella prior to kindergarten entry.

**Students are required to have Tdap prior to entry into 6th grade. One dose of Tdap is required for sixth through 12th grades.

All students attending an institute of higher learning provide proof of immunity to measles, mumps, and rubella diseases.

New college and university students living in student housing must review and sign the [Meningococcal Disease Information Sheet](#).

Reported Cases of Select Vaccine Preventable Diseases, Colorado 2014-2019

Report Year	Invasive H. Influenzae type b (Hib)	Measles	Meningococcal Disease	Mumps	Pertussis (Whooping cough)	Invasive Pneumococcal Disease	Varicella
2019	0	1	6	68	461	555	241
Five-Year Average (2014-2018)	1	<1	6	29	835	554	312
2018	3	0	7	33	616	592	259
2017	0	0	6	83	672	655	272
2016	0	1	4	18	716	513	330
2015	2	1	6	6	914	506	311
2014	1	1	7	4	1,259	459	386

Note: During 2014-2019 no congenital rubella, diphtheria, polio, or rubella cases were reported. During 2014-2019, there were four cases of tetanus reported in Colorado (two in 2015, one in 2018, and one in 2019). Case counts for hepatitis A, hepatitis B, and influenza are available in other CDPHE surveillance reports, as described below. Five year averages were rounded to the closest whole number.

Diphtheria

Diphtheria, a rare disease in the United States, is caused by infection with toxigenic (toxin-producing) strains of the bacterium *Corynebacterium diphtheriae*. Important sites of infection are the respiratory mucosa (respiratory diphtheria) and skin (cutaneous diphtheria).

No cases of diphtheria were reported in Colorado or the United States in 2019. The last case of diphtheria reported in Colorado was in 1985.

CDC's Advisory Committee on Immunization Practice (ACIP) recommends routine vaccination with diphtheria-containing vaccine, DTaP (diphtheria, tetanus, and acellular pertussis vaccination) at two, four, six, and 15 through 18 months and 4 through 6 years¹, followed by a dose of Tdap at 11-12 years of age. pregnant people are recommended a single dose of Tdap during every pregnancy and adults should receive a single dose of Td or Tdap vaccine every 10 years. Adults who have never received Tdap also are recommended to receive a booster dose of Tdap.²

Haemophilus influenzae (Hi)

Haemophilus influenzae is a bacteria that can cause many different kinds of infections from mild ear infections to severe disease, like bloodstream infections. Only *H. influenzae* infections in sterile sites of the body such as blood, spinal fluid, and joint fluid are considered invasive and reported to CDPHE. These infections with *H. influenzae* are usually severe, requiring treatment in a hospital, and can sometimes result in death. The most common types of invasive disease caused by *H. influenzae* are: pneumonia (infection in the lungs), bacteremia (infection in the blood), meningitis (infection of the tissue covering of the brain and spinal cord), and infectious arthritis (inflammation of the joint). CDPHE does not track noninvasive *H. influenzae* disease, such as ear infections.

There are six serotypes, or strains, of *H. influenzae* (a through f), depending on the outer covering of the bacteria, or polysaccharide capsule. There is also a strain of *H. influenzae* called non-typeable because this strain lacks a capsule around the bacteria. CDPHE requires labs to send isolates from all invasive *H. influenzae* cases to determine the serotype and track trends in disease. Occasionally, a laboratory discards an isolate before submitting it for serotyping. This is why a few cases every year have an unknown serotype.

Before the introduction of effective vaccines, *H. influenzae* type b (Hib) caused more than 95% of invasive disease in children younger than five-years-old.³ In the post-vaccine era,

¹ CDC. Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee

² CDC. Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP)- United States, 2019. MMWR 2020 Jan 24; 69(3);77-83

³ CDC. Prevention and Control of *Haemophilus influenzae* Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2014 Feb 28 ; 63 (RR01); 1-14. CDC.

non-typeable *H. influenzae* causes the majority of invasive disease in all age groups. Hib is rare in Colorado. Only Hib is preventable by vaccination; the other types of *H. influenzae* are not.

ACIP recommends routine vaccination with a conjugate Hib vaccine series beginning at two months of age, in either a two-dose or a three-dose series, depending on the vaccine chosen. A booster of any licensed conjugate Hib vaccine at age 12 through 15 months is recommended.⁴

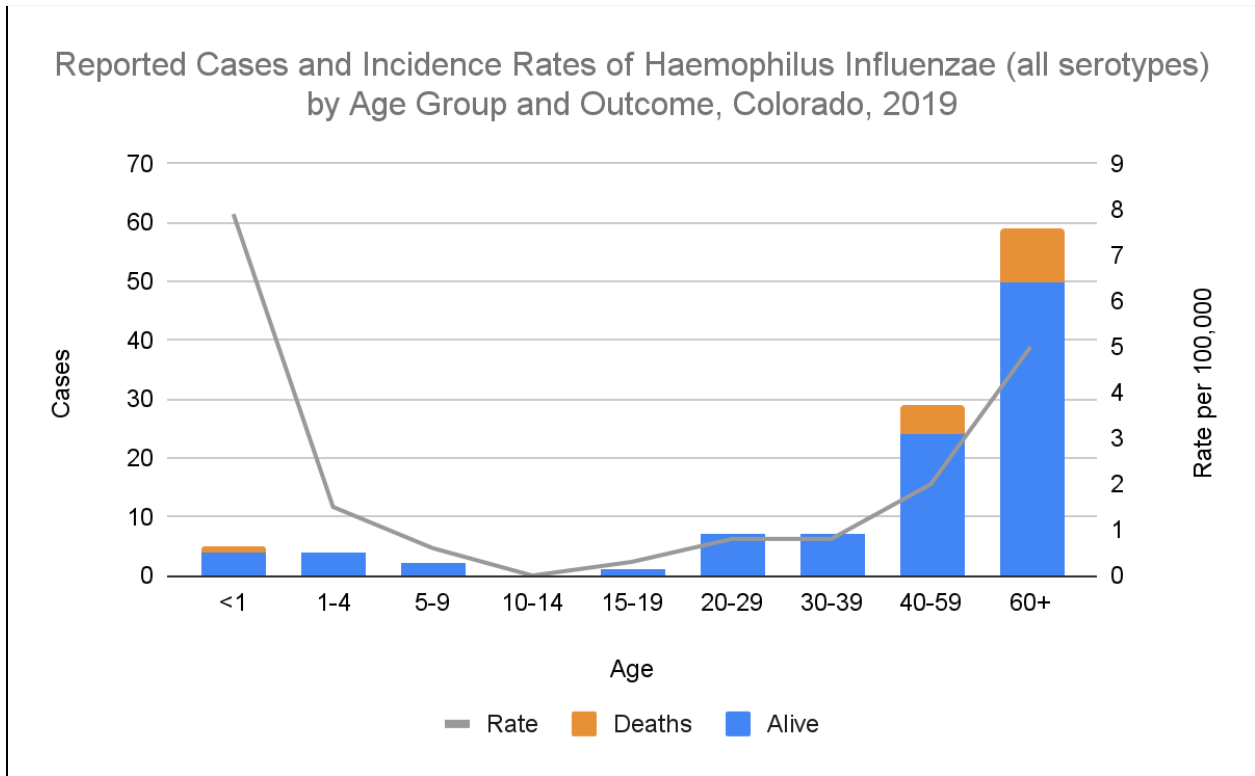


Figure 1: There were 114 total cases of Haemophilus Influenzae in 2019, with the majority of cases and deaths in the 60+ age group.

⁴ CDC. Prevention and Control of *Haemophilus influenzae* Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2014 Feb 28 ; 63 (RR01); 1-14.

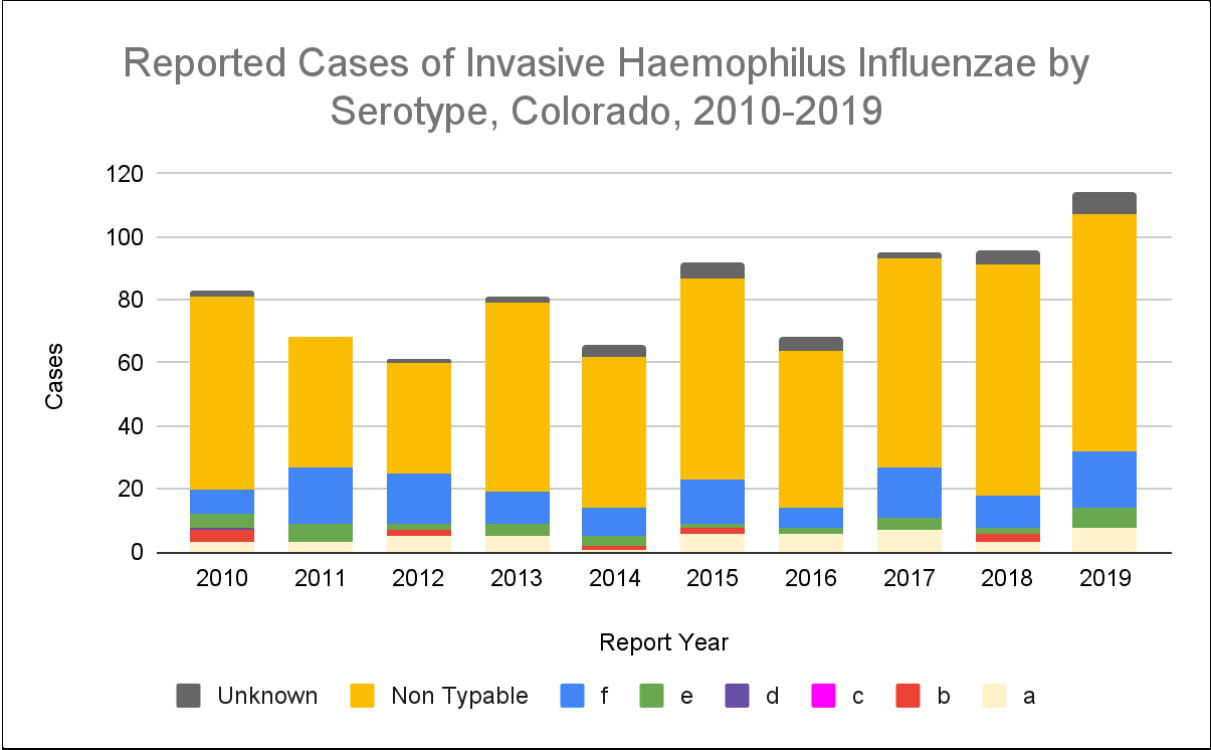


Figure 2: Though the proportion of types varies by year, non-typeable remains the dominant strain.

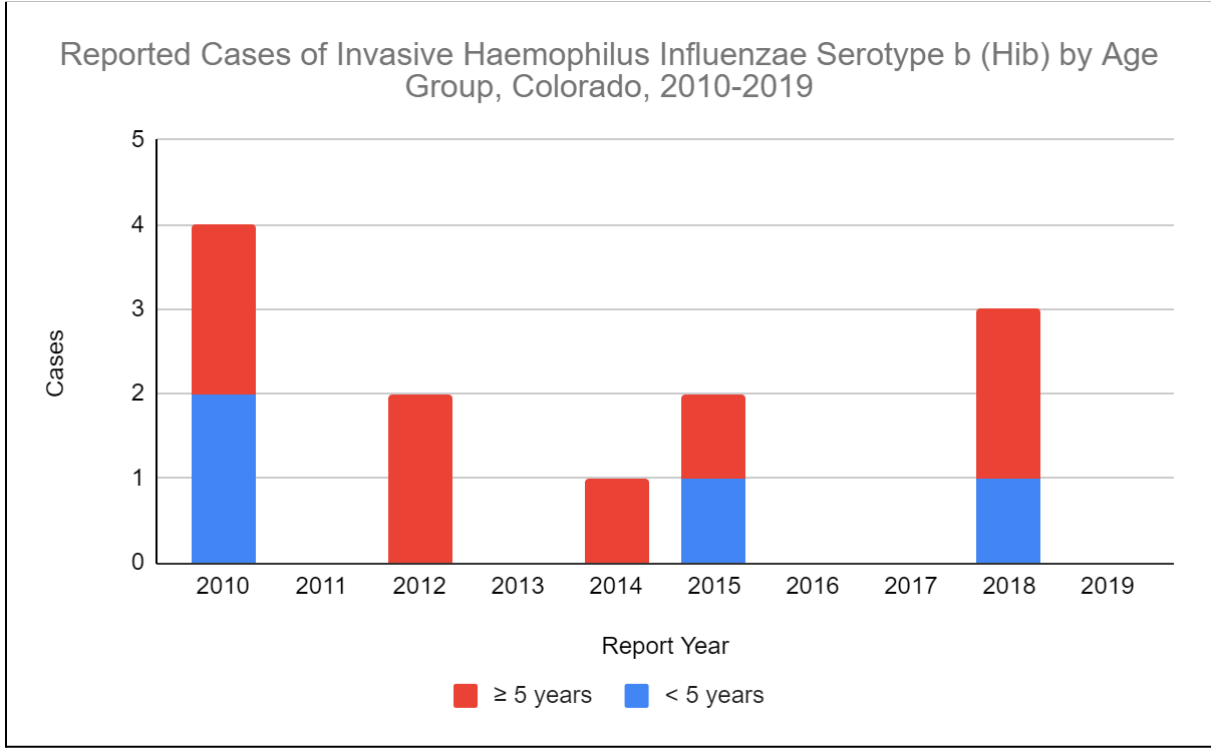


Figure 3: Of the four cases of Hib <five years of age reported 2010-2019, one was unvaccinated and one case was not appropriately vaccinated for their age.

Hepatitis A and B

Hepatitis A (HAV) and hepatitis B (HBV) viral infections are reportable in Colorado. Hepatitis A is typically a foodborne or person-to-person illness that appears only as an acute (newly occurring) infection that does not become chronic. The virus is transmitted by eating or drinking contaminated food or water, or by contact with an infected person. People with hepatitis A infection can have a mild illness lasting a few weeks to a more severe illness requiring hospitalization. Infected people usually improve without treatment.

A vaccine to prevent hepatitis A infection was introduced in 1995. ACIP recommends that all children receive two doses of hepatitis A vaccine beginning at one year of age or older, with a minimum of six months between doses.⁵ A two dose series of hepatitis A vaccine with a minimum interval of six months, or a three dose series of combined hepatitis A and hepatitis B vaccine are recommended for adults who want protection from hepatitis A or who are at risk for infection.⁶

Hepatitis B is typically a bloodborne illness that can occur as an acute or chronic infection. It can range in severity from a mild illness that clears on its own within a few weeks, to a serious chronic illness that can result in death. The virus can replicate in the liver for years, oftentimes without obvious symptoms, until severe, irreparable damage has occurred.

ACIP recommends infants receive a three-dose series of hepatitis B vaccines at age zero, one, and between six and 18 months.⁷ Children not previously vaccinated with hepatitis B vaccine should receive a three-dose series, to include an interval of at least four weeks between the first and second dose, an interval of at least eight weeks between the second and third dose AND an interval of at least 16 weeks between the first and third doses.⁸ Hepatitis B vaccination is recommended for all unvaccinated adults at risk for HBV infection and for all adults requesting protection from HBV infection. Acknowledgment of a specific risk factor should not be a requirement for vaccination.⁹

Adults age 18 years or older may receive the combined HAV and HBV vaccine as a three-dose series with one and six month intervals between doses (zero, one, and six months) or four-dose, accelerated series (three doses at zero, seven, and 21–30 days, followed by a booster dose at 12 months.)¹⁰

⁵ CDC. Recommended Immunization Schedules for Persons Aged 0 Through 18 Years, United States, 2021

⁶ Prevention of Hepatitis A Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2020. *Recommendations and Reports* / July 3, 2020 / 69(5);1–38.

⁷ CDC. Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2021.

⁸ CDC. Catch-up immunization schedule for persons aged 4 months–18 years who start late or who are more than 1 month behind, United States, 2021.

⁹ CDC. Epidemiology and Prevention of Vaccine-Preventable Disease. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015.

¹⁰ Prevention of Hepatitis A Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2020

Beginning in October of 2018, Colorado experienced a significant increase in hepatitis A cases that were eventually linked to an outbreak impacting people experiencing homelessness and people with substance use issues. At least 30 states were impacted by similar outbreaks. This outbreak continued during 2019. CDPHE partnered with local public health agencies and community organizations to support outreach, immunization, and education efforts.¹¹ In 2019, 332 cases of hepatitis A were reported to CDPHE.

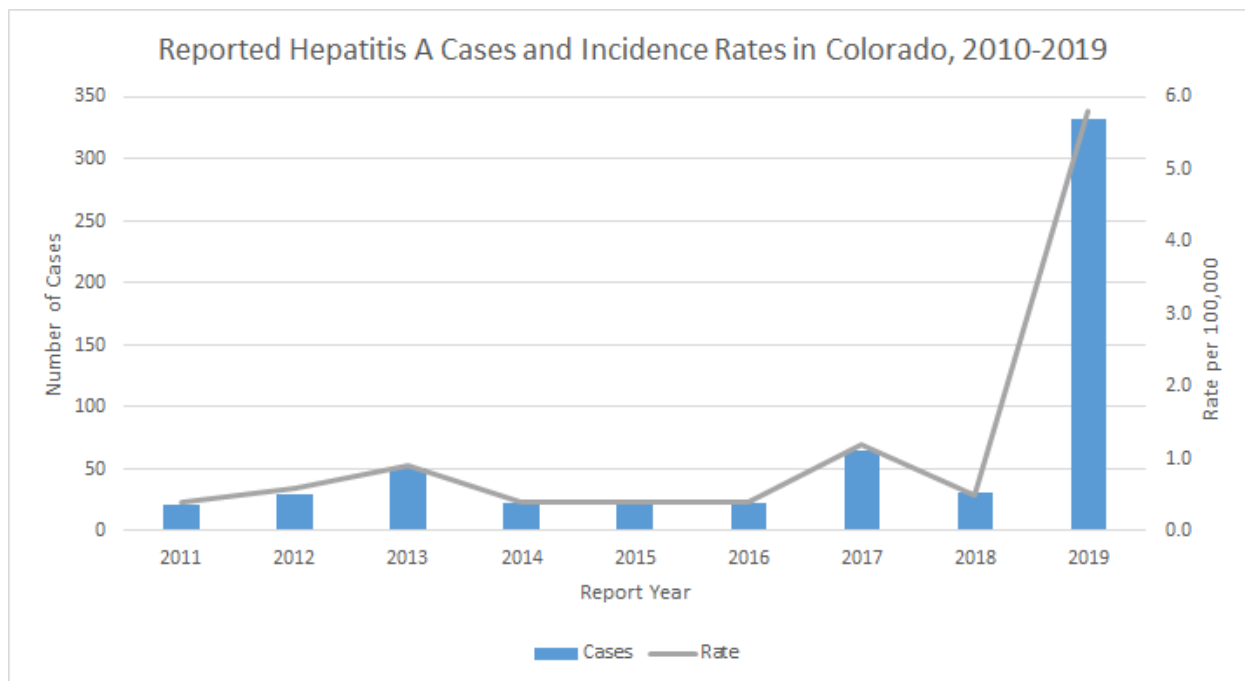


Figure 4: 2019 experienced a dramatic increase in incidence as a result of a multi-state outbreak.

See the full viral hepatitis reports at: <https://www.colorado.gov/pacific/cdphe/hepatitis-data>.

Influenza

Influenza (also known as flu) is a contagious respiratory illness caused by influenza viruses. Infection can cause mild to severe illness, and at times can lead to death. Most people who get flu will recover in a few days to less than two weeks, but some people will develop complications, such as pneumonia, inflammation of the heart (myocarditis), or brain (encephalitis), and multi-organ failure.

Hospitalizations due to influenza and influenza-associated deaths in children less than 18 years of age are reportable in Colorado. In addition, CDPHE conducts additional influenza surveillance activities including: reporting of influenza-like illness visits by selected clinical sites, reporting of influenza testing activity by sentinel hospital labs, monitoring circulating influenza

¹¹ Immunize Colorado. Hepatitis A Prevention. <https://www.immunizecolorado.org/healthcare-professionals/hepatitis-a-prevention>.

viruses through molecular typing at the CDPHE laboratory, and reporting of outbreaks of influenza in schools and group residential settings.

ACIP recommends routine annual influenza vaccination for all persons aged six months and older who do not have contraindications.¹²

See the full influenza summary report at: <https://www.colorado.gov/pacific/cdphe/influenza>

Measles

Measles is an acute viral illness. The classic symptoms of measles are a generalized rash lasting more than three days, a temperature of greater than 101°F/38.3°C and the onset of a cough, runny nose and/or red swollen eyes. In 2000, measles was declared eliminated from the United States. Although endemic (acquired in the United States) measles has been eliminated in the United States, importation of measles will continue to occur as measles remains endemic in many other parts of the world. Thus, current measles epidemiology in the United States and Colorado is determined by characteristics of the imported cases and their susceptible contacts.

ACIP recommends routine vaccination with the measles, mumps, and rubella (MMR) vaccine at age 12 through 15 months and a second dose at age four through six years. Adults with no evidence of immunity should get at least one dose of MMR vaccine. People who attend college, travel internationally, or who work in health care settings should have two doses of MMR vaccine.¹³

¹²MMWR. Prevention and Control of Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices, United States, 2015-2016 Influenza Season. 2015 Aug 7; 64(30); 818-825.

¹³ CDC. Prevention of Measles, Rubella, Congenital Rubella Syndrome and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP). 2013 Jun 14; 62 (RR04); 1-34.

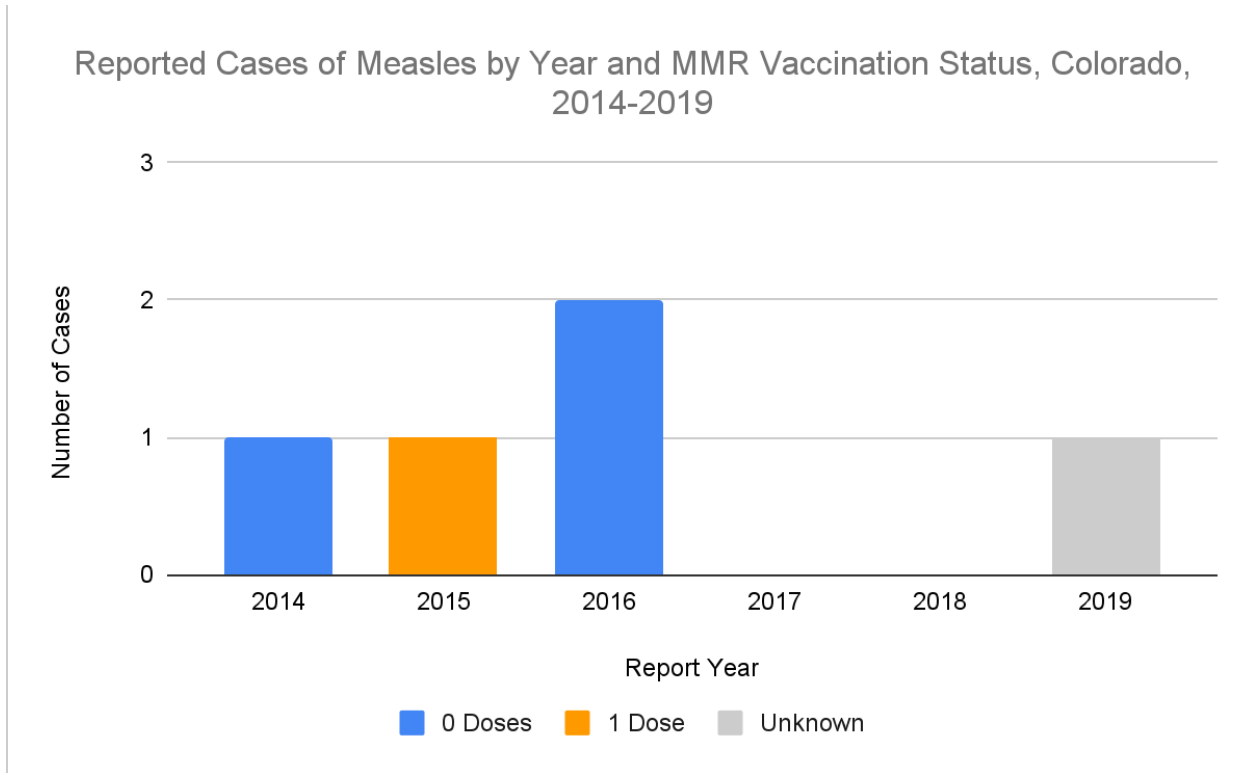


Figure 5: The unvaccinated case reported in 2014 and one of the unvaccinated cases from 2016 were too young to receive measles vaccination. The case in 2015 had one recorded vaccine, but it was administered prior to the recommended age for vaccination. The second unvaccinated case in 2016 was an adult eligible for vaccination. No cases of measles were reported in 2017 or 2018. The unvaccinated case in 2019 was an adult eligible for vaccination.

Meningococcal Disease

Meningococcal disease is a serious and often life-threatening infection caused by the bacterium *Neisseria meningitidis*. When this bacteria invades sterile sites of the body like blood or spinal fluid, meningococcal disease occurs. Of the several types of *N. meningitidis*, serogroups A, B, C, W, and Y are the primary causes of invasive meningococcal disease.

Invasive *N. meningitidis* infection can cause several types of illnesses, including meningitis (inflammation of the membrane around the brain and spinal cord), sepsis (infection of the blood), or pneumonia (infection of the lungs). Meningococcal disease develops rapidly, even among previously healthy people. Despite appropriate antibiotic treatment, about 15% of cases of meningococcal disease are fatal. Among those who survive, 10%–20% have long term effects that may include limb loss, extensive skin scarring, hearing loss, cognitive defects, or seizure disorders.¹⁴

N. meningitidis is spread via small droplets or mucus by coughing, sharing drinks or vaping devices or by being in close or lengthy contact with someone who carries the bacteria. Many

¹⁴ Meningococcal Vaccination: Recommendations of the Advisory Committee on Immunization Practices, United States, 2020 Recommendations and Reports / September 25, 2020 / 69(9);1–41.

people carry the bacteria in their nose or throat, but most do not develop invasive disease.¹⁵ Invasive meningococcal disease occurs throughout the year in Colorado.

ACIP recommends routine vaccination with a quadrivalent meningococcal conjugate vaccine (MenACWY) among children ages 11 to 12 years with a booster dose at 16 years. ACIP also recommends routine vaccination for people at increased risk of developing meningococcal disease. In the fall of 2015, ACIP began recommending that children and young adults aged 16 to 23 years may be vaccinated with a serogroup B meningococcal (MenB) vaccine based on shared clinical decision-making to provide short-term protection against most strains of serogroup B meningococcal disease.¹⁶

In 2019, Colorado experienced an outbreak of serotype W135 meningococcal disease (MenW) among people experiencing homelessness or housing instability in the Denver metro-area. We saw four closely related cases from April to November, including one death. Public health activities included collaboration with an ongoing hepatitis A vaccination effort to vaccinate those thought to be at the highest risk of meningococcal disease.

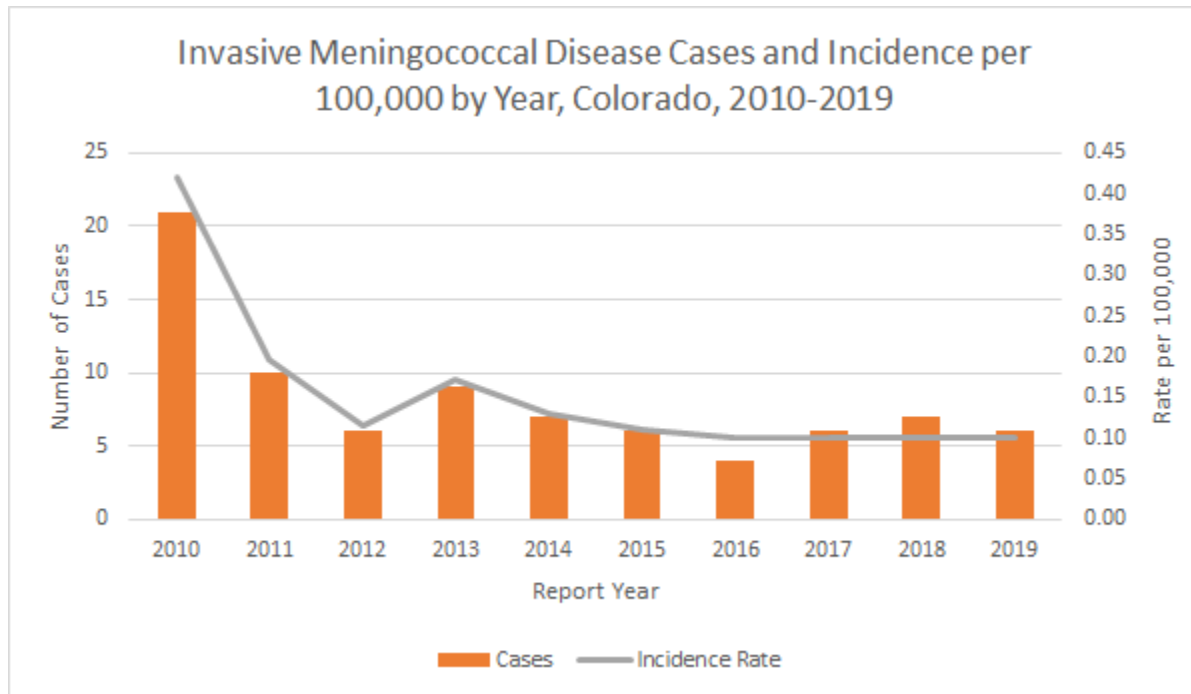


Figure 6: Incidence rates of Meningococcal disease have generally remained consistent over the last few years.

¹⁵ VPD Surveillance Manual, Meningococcal Disease: Chapter 8: Meningococcal Disease. Lucy A. McNamara, PhD, MS; Amy Blain, MPH.

¹⁶ Meningococcal Vaccination: Recommendations of the Advisory Committee on Immunization Practices, United States, 2020 Recommendations and Reports / September 25, 2020 / 69(9);1-41.

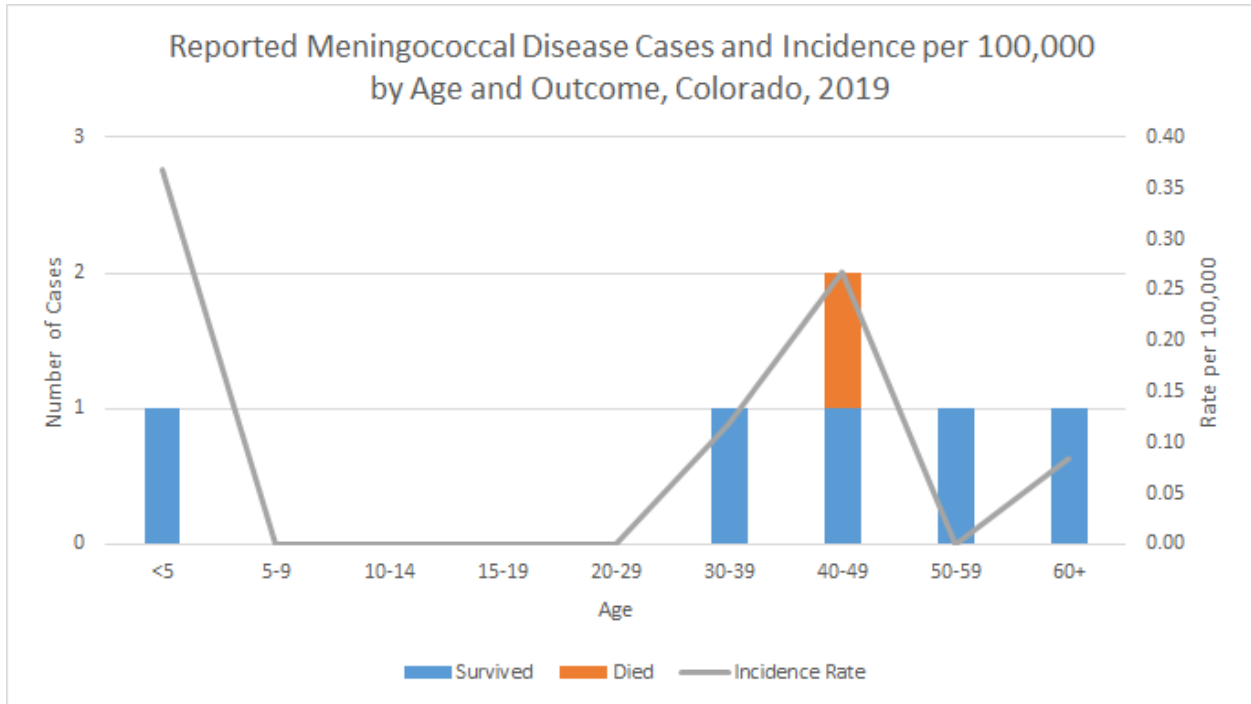


Figure 7: Of the six total cases of Meningococcal disease in 2019, none were between the ages of five and 29 and there was a single death.

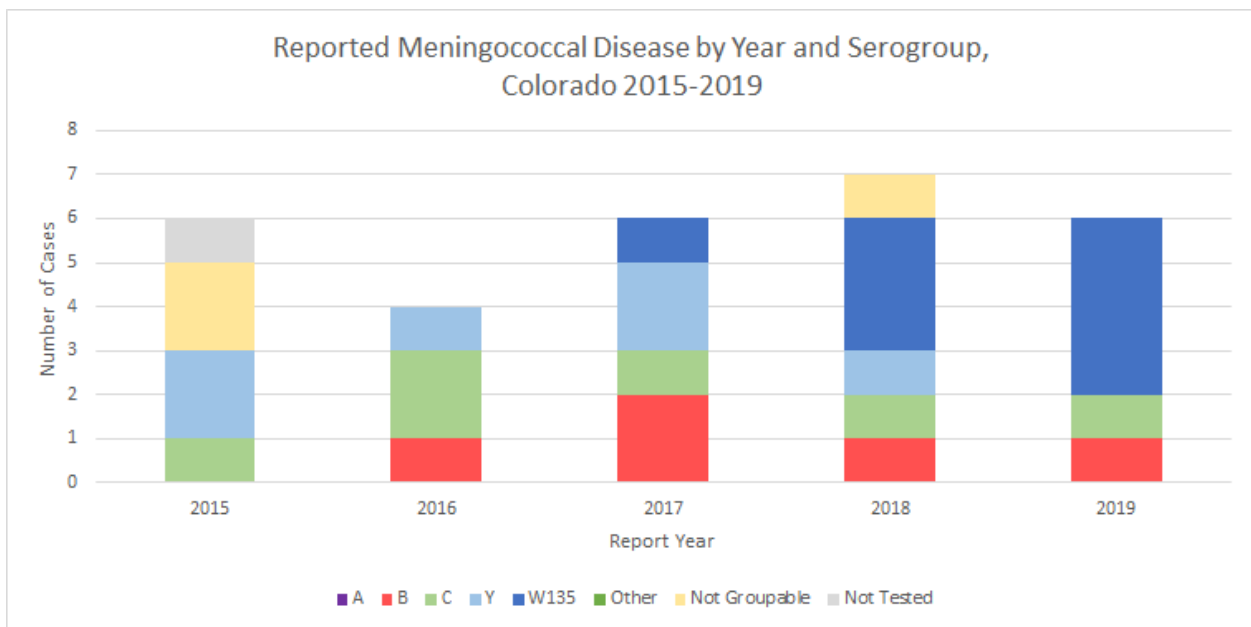


Figure 8: Meningococcal conjugate vaccine contains antigens from serogroups A, C, Y and W-135. Five of the six invasive meningococcal disease cases in 2019 were caused by these serogroups. All were beyond the age range usually indicated for conjugate vaccination. It is unknown how many had received the vaccine. The single case of invasive meningococcal disease serotype B was in a child not eligible for vaccination. There were no cases of meningococcal disease serogroup A during 2015-2019.

Mumps

Mumps is an acute viral illness. The classic symptom of mumps is swelling of the parotid gland (parotitis) or other salivary glands along the jaw. Swelling usually lasts at least two days, but may last up to 10 days. Other symptoms of mumps include jaw pain, fatigue or tiredness, and swelling of the testicles or ovaries. Some people with mumps only have respiratory symptoms or no symptoms at all.

Results from several outbreak investigations showed that hospitalizations and overall complications are lower in people who were fully vaccinated compared with people who were unvaccinated. Severe complications of mumps are uncommon, but occur more often in adults than children. Among all persons infected with mumps, reported rates of pancreatitis, deafness, meningitis, and encephalitis were less than 1%.¹⁷

ACIP recommends routine vaccination with the measles, mumps, and rubella (MMR) vaccine at age 12 through 15 months and a second dose at age four through six years. Adults with no evidence of immunity should get at least one dose of MMR vaccine. People who attend college, travel internationally, or who work in healthcare settings should receive two doses of MMR vaccine.¹⁸

Between January 2016 and June of 2017, 150 mumps outbreaks were recorded by health departments across the United States. Outbreak settings included households, workplaces, schools, universities, sports teams, and church groups.¹⁹ Colorado also saw an increase in mumps cases and outbreaks during 2017. One large Colorado outbreak during 2017 was found to be linked to a large outbreak in Arkansas with nearly 3,000 cases.

Nationwide, 2018 saw a decrease in the number of mumps cases and outbreaks; however, there were still more than 2,500 cases of mumps nationwide, many of which were found among adults held in immigration detention centers.¹⁸

During 2019, there were outbreaks among individuals detained at two immigration facilities located in Colorado. Concurrently, there were multiple outbreaks of mumps in immigration detention centers across the United States. There was also an outbreak among staff at a ski resort. The affected staff all worked alongside one another sharing break areas and restrooms.

¹⁷ Centers for Disease Control and Prevention. (2018, January 31). *Mumps - Vaccine Preventable Diseases Surveillance Manual*. Centers for Disease Control and Prevention. <https://www.cdc.gov/vaccines/pubs/surv-manual/chpt09-mumps.html>.

¹⁸ CDC. Prevention of Measles, Rubella, Congenital Rubella Syndrome and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP). 2013 Jun 14; 62 (RR04); 1-34.

¹⁹ Centers for Disease Control and Prevention. (2021, July 12). *Mumps*. Centers for Disease Control and Prevention. <https://www.cdc.gov/mumps/outbreaks.html>.

Reported Mumps Cases by Year and Incidence Rates, Colorado and United States, 2010-2019

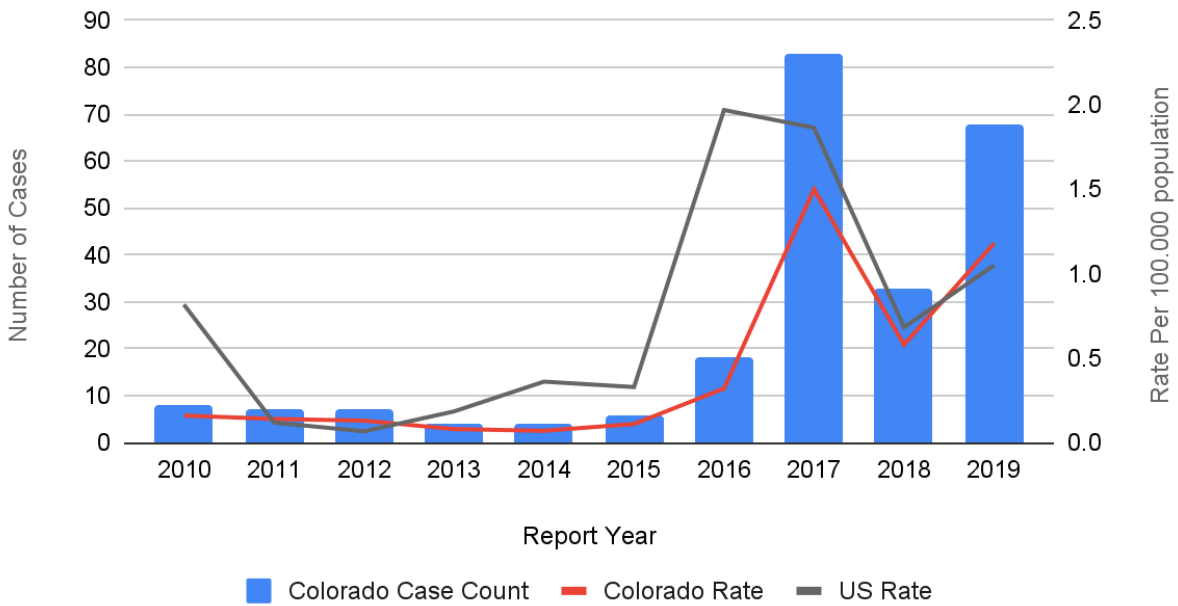


Figure 9.

Reported Cases of Mumps by Age Group and Number of Mumps-Containing Vaccine Doses, Colorado, 2019

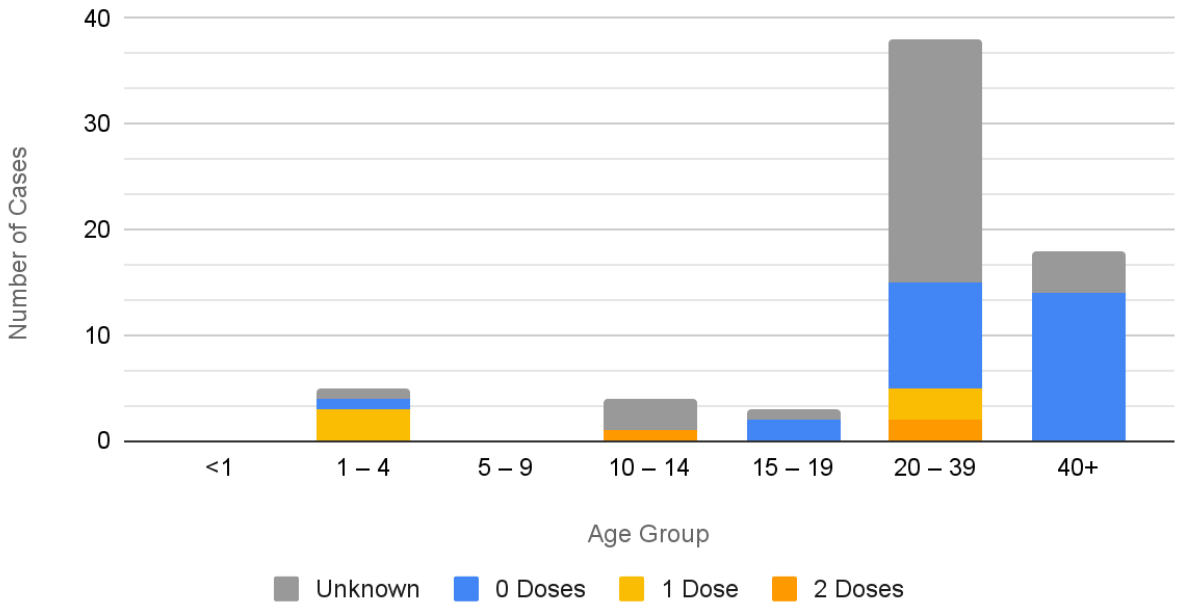


Figure 10: It is uncommon for adults to have documentation of pertussis vaccination from childhood available, hence the higher numbers of unknown doses among cases over age 20.

Pertussis (Whooping cough)

Pertussis, or “whooping cough,” is a respiratory disease caused by the bacterium *Bordetella pertussis* and spreads easily from person-to-person. The illness is characterized by a severe cough lasting more than two weeks with coughing fits followed by a high-pitched intake of breath that creates a “whooping” sound.

Pertussis rarely causes severe complications in healthy, vaccinated people. However, infants are at greatest risk for pertussis-related complications and death. Pneumonia is the most common complication in all age groups; seizures and encephalopathy (brain swelling) are rare and generally occur only among very young infants. Death is infrequent and most likely to occur in unvaccinated infants, although deaths occasionally occur in older children and adults with serious underlying health conditions.

Laboratory surveillance to monitor changes in *B. pertussis* is important. Isolates of *B. pertussis* collected through enhanced surveillance are vital to understanding the evolution of the bacteria and how those changes may impact the current pertussis vaccination program and other prevention strategies.

Starting in 2012, Colorado and the United States experienced epidemic levels of pertussis. While cases have decreased since 2012, levels remain high compared to the annual average number of cases in the 1980s and 1990s. Multiple factors have likely contributed to the increase including waning immunity from acellular pertussis vaccines; heightened provider and public awareness; improved testing; and possibly molecular changes within the pertussis bacterium. The incidence of pertussis remains highest among young infants.

ACIP recommends routine vaccination with pertussis-containing vaccine, DTaP (diphtheria, tetanus, and acellular pertussis vaccination) at two, four, six, and 15 through 18 months and four through six years, followed by a dose of Tdap at 11-12 years of age. pregnant people are recommended a single dose of Tdap during every pregnancy. For adults who have never received Tdap, a dose of Tdap can replace one of the 10-year Td booster doses.²⁰

²⁰ CDC. Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2018 Apr 27; 67(2);1-44

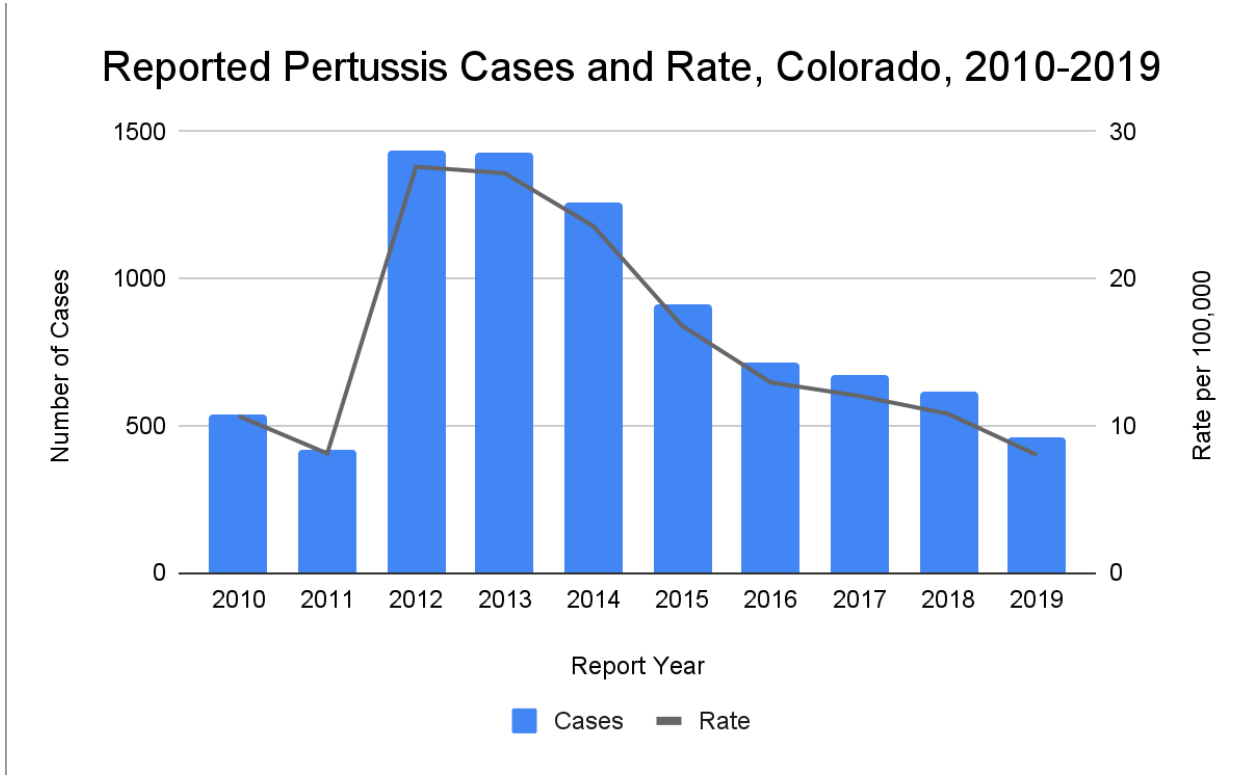


Figure 11. Cases of pertussis reached a record high during 2012 and have been declining since. The rate of pertussis in Colorado was 8 people per 100,000.

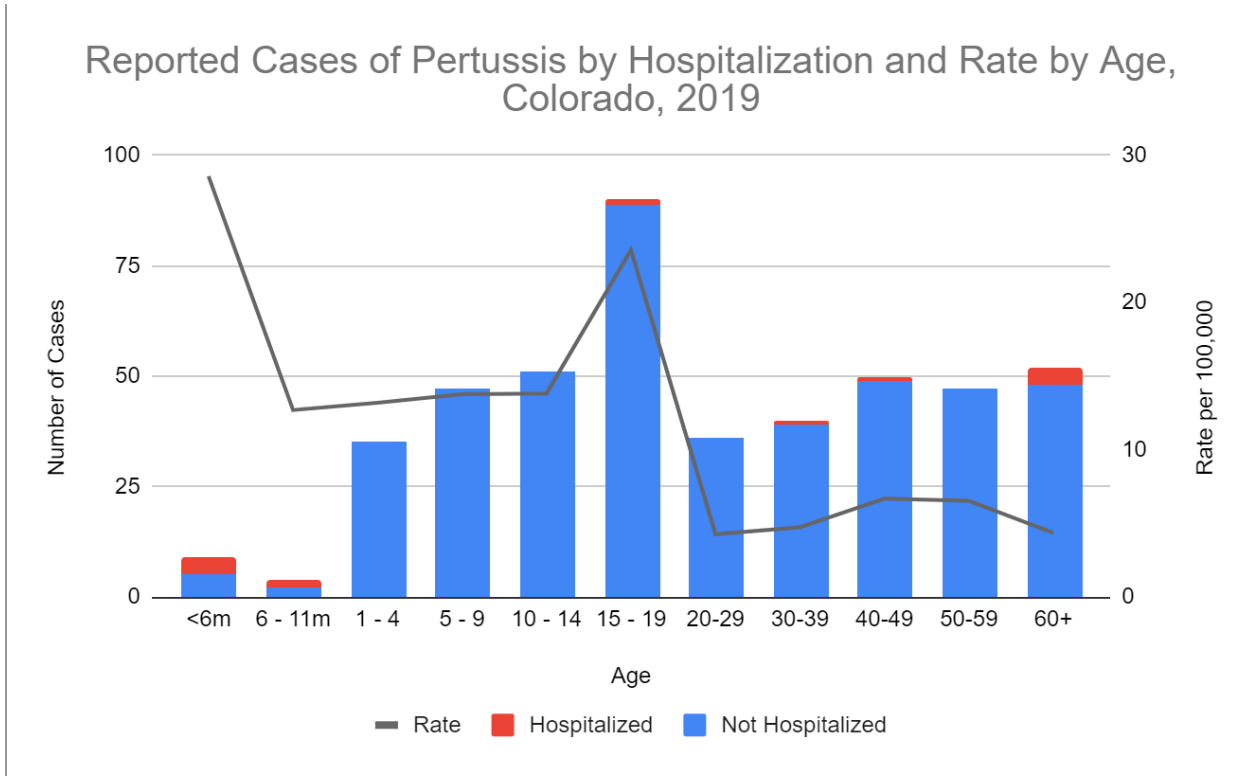


Figure 12. Cases and rates of pertussis by age in Colorado. Of the 461 cases reported in 2019, 265 were classified as confirmed and 196 were probable. The average number of days hospitalized in 2019 was 10.6 days (median of five days) with the maximum being 18 days. The rate of pertussis is highest among infants.

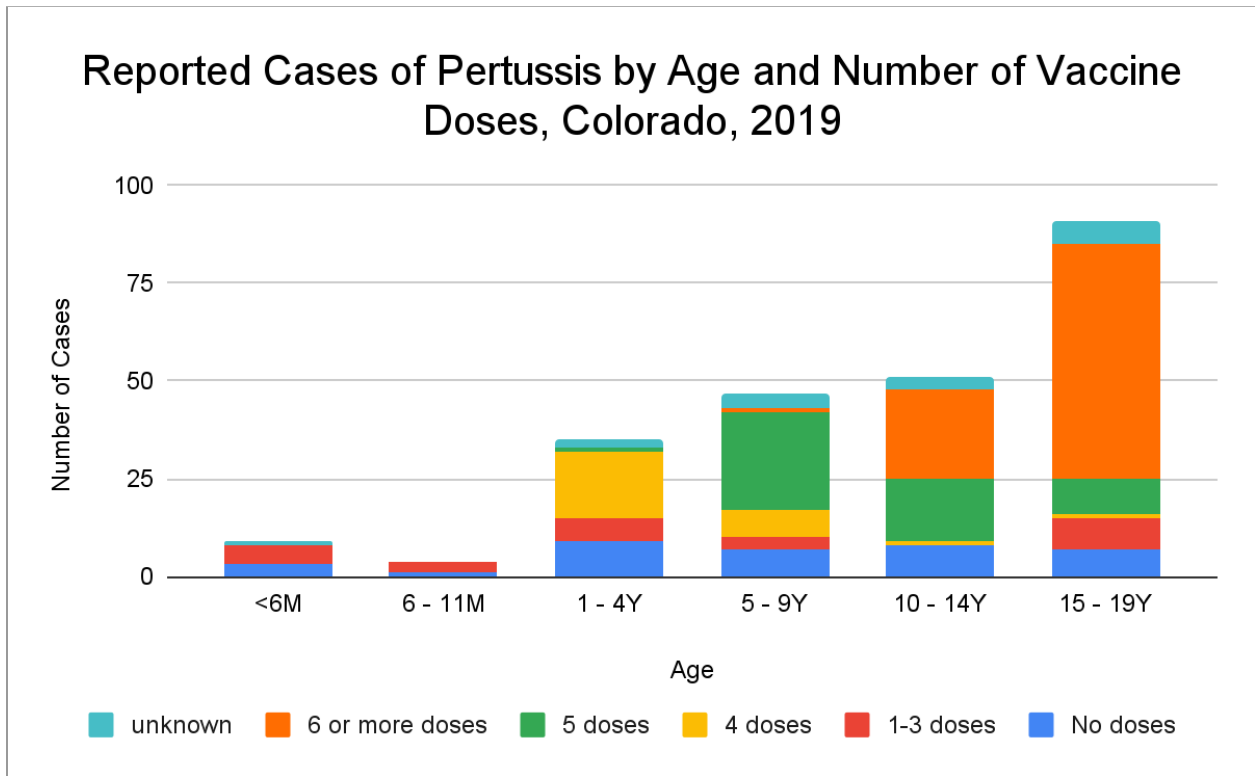


Figure 13. Cases of pertussis among individuals aged 0-19 years by number of vaccine doses.

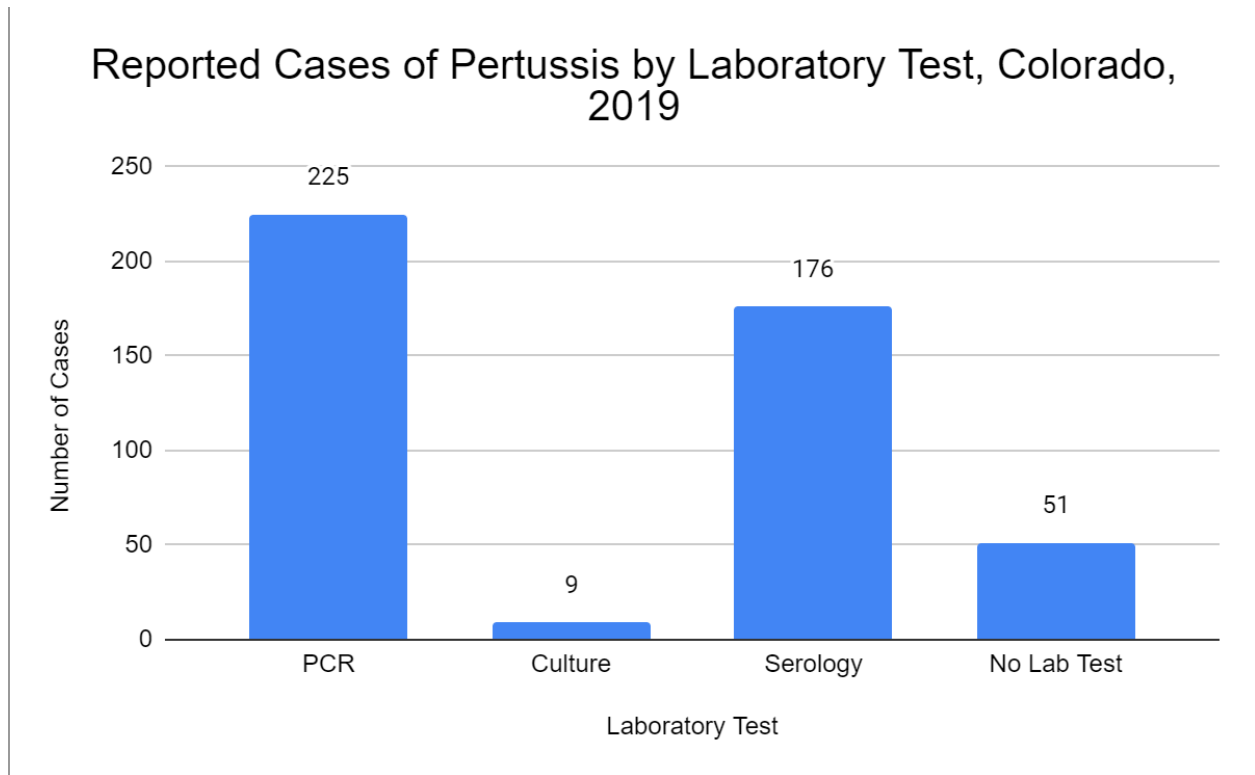


Figure 14. Cases of pertussis by reported laboratory test. In some cases, multiple laboratory tests were performed. Not all pertussis cases are tested. People who are epidemiologically linked to a confirmed case and people who exhibit classic pertussis symptoms without another apparent cause may also be classified as pertussis cases.

Pneumococcal Disease, Invasive

Invasive pneumococcal disease (IPD) is an infection in the blood, spinal fluid, or other sterile body site with the bacteria, *Streptococcus pneumoniae*, or pneumococcus. Pneumococcus is the most common cause of bloodstream infections, pneumonia, meningitis, and middle ear infections in young children. Adults older than 65 years are also at increased risk, especially if they have certain chronic illnesses such as asthma, heart disease, or cancer. Two types of vaccines are available (PCV13 or Prevnar and PPSV23 or Pneumovax23) to prevent against the most common strains of pneumococcal disease.

Following the introduction of the pneumococcal conjugate vaccines in children in the United States (PCV7 in 2000 and PCV13 in 2010), dramatic declines in invasive pneumococcal disease among those younger than five years-old were reported nationwide. All children two through 59 months of age should be routinely vaccinated with PCV13 following ACIP guidelines. The primary series beginning in infancy consists of three doses routinely given at two, four, and six months of age. A fourth (booster) dose is recommended at 12–15 months of age.²¹

²¹ CDC. Epidemiology and Prevention of Vaccine-Preventable Disease. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015.

PCV13 was introduced in 2012 for use among adults 19 years or older with immunocompromising conditions and in 2014 for all adults 65 years or older. However, declines in invasive pneumococcal disease were seen as early as 2001 among adults because of the use of pneumococcal conjugate vaccines in children (herd protection). Adults 65-years-old or older who have not previously received pneumococcal vaccine or whose previous vaccination history is unknown should receive a dose of PCV13. A dose of PPSV23 should be given 6-12 months after the dose of PCV13.²²

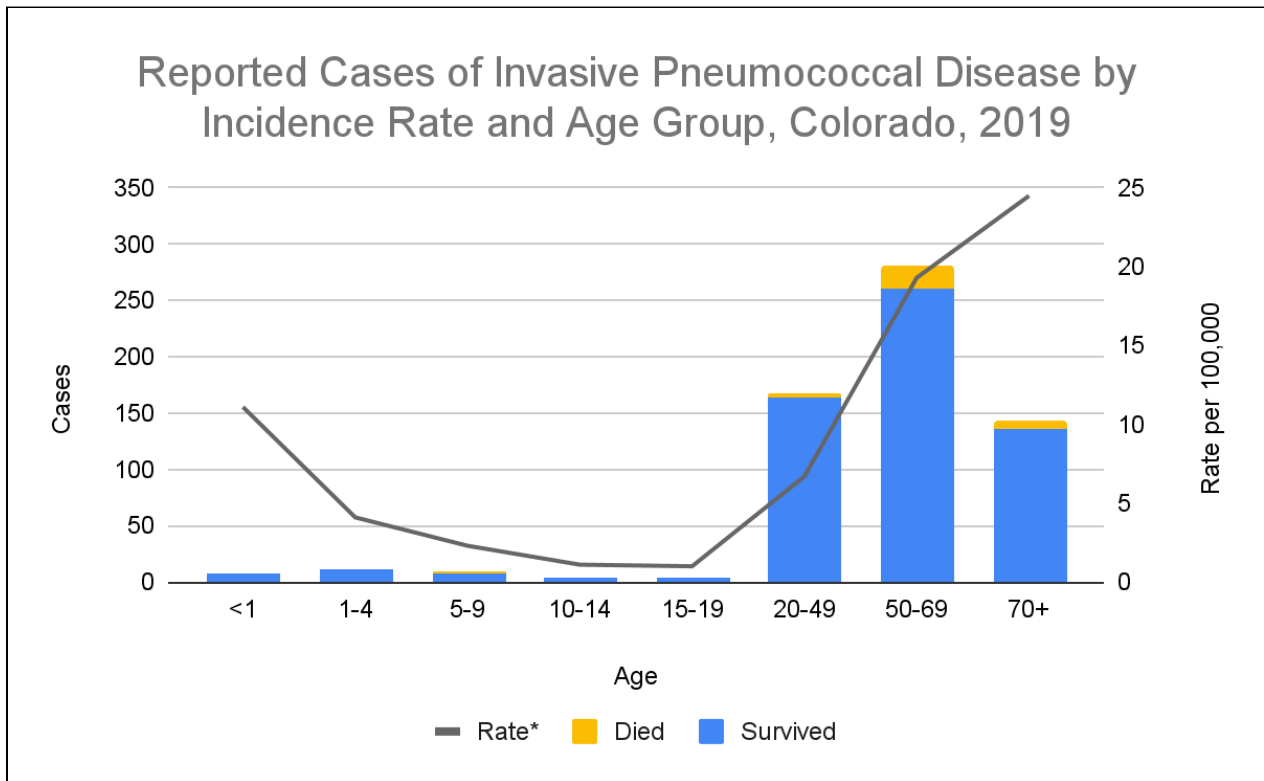


Figure 15.

²² CDC. Epidemiology and Prevention of Vaccine-Preventable Disease. Hamboraksy J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015.

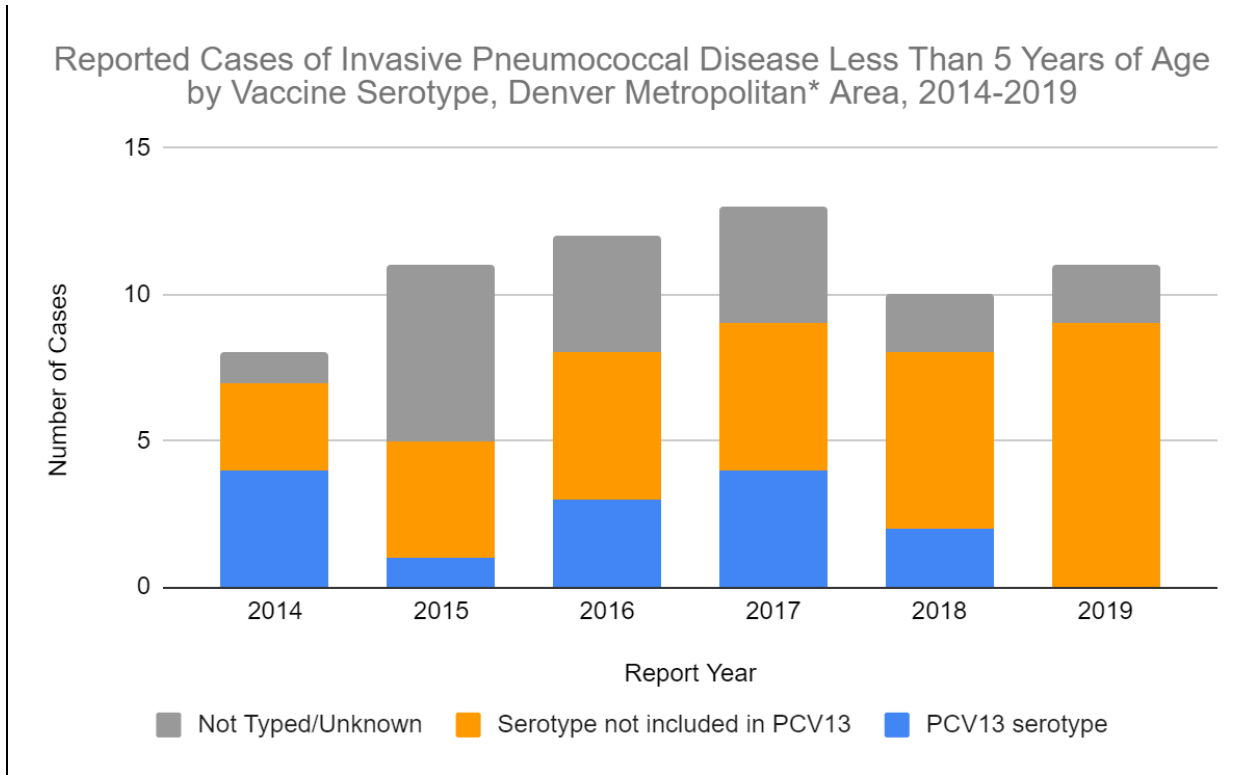


Figure 16: *Isolates from residents in the Denver Metro Area (Adams, Arapahoe, Denver, Douglas, and Jefferson County) with invasive pneumococcal disease are serotyped at CDC as part of the Emerging Infections Program (EIP). Serotypes included in PCV13 vaccine are 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F.

Polio

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

ACIP recommends routine immunization with inactivated poliovirus vaccine (IPV) at ages two, four, six through 18 months, and four through six years.²³

Rubella

No rubella cases were reported in Colorado during 2019. The last reported case of rubella in Colorado was in 2003.

ACIP recommends routine vaccination with the measles, mumps, and rubella (MMR) vaccine at age 12 through 15 months and a second dose at age four through six years. Adults with no evidence of immunity should get at least one dose of MMR vaccine. People who attend college,

²³ CDC. Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP) Regarding Routine Poliovirus Vaccination. 2009 Aug 7; 58 (30); 829-830.

travel internationally, or who work in health care settings should have two doses of MMR vaccine.²⁴

Tetanus

During 2010-2019, there were four cases of tetanus reported in Colorado (two in 2015, one in 2018, and one in 2019). One of the 2015 cases had not received a tetanus vaccine in more than 25 years and the vaccination status of the second 2015 case is unknown. The 2018 and 2019 cases had unknown vaccination status. All four cases recovered from the illness.

ACIP recommends routine vaccination with tetanus toxoid-containing vaccine, DTaP (diphtheria, tetanus, and acellular pertussis vaccination) at two, four, six, and 15 through 18 months and four through six years, followed by a dose of Tdap at 11-12 years of age. pregnant people are recommended a single dose of Tdap during every pregnancy. Adults should receive a single dose of Td vaccine every 10 years. A dose of Tdap can replace one of the 10-year Td booster doses. Adults who have never received Tdap also are recommended to receive a booster dose of Tdap.²⁵

Varicella (chickenpox)

Chickenpox is caused by the varicella-zoster virus (VZV). Primary infection with VZV causes varicella (chickenpox). VZV has the ability to persist in the body as a latent infection. Shingles, also known as herpes zoster, results from the reactivation of the latent VZV infection. In Colorado, only cases of primary varicella (chickenpox) are reported to CDPHE. Providers are not required to report shingles cases in Colorado.

Varicella (chickenpox) causes a blister-like rash, itching, fatigue, and fever. The rash may first appear on the stomach, back, and face and can spread over the entire body causing hundreds of itchy blisters. Varicella (chickenpox) is highly contagious and can be serious, especially in babies, pregnant people, and those with weakened immune systems. It is transmitted via respiratory airborne droplets or contact with fluids from the mouth and nose or the blister-like rash. People with varicella (chickenpox) should not attend child care, school, or work until the rash has crusted over.

ACIP recommends a first varicella vaccine dose for children between 12 and 15 months of age with a second dose administered between 4 and 6 years of age. A second dose of varicella vaccine is also recommended for persons older than 6 years of age who have received only one dose.²⁶ Adults and adolescents who have not received any varicella vaccination and do not

²⁴ CDC. Prevention of Measles, Rubella, Congenital Rubella Syndrome and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP). 2013 Jun 14; 62 (RR04); 1-34.

²⁵CDC. Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2018 Apr 27; 67(2);1-44

²⁶ CDC. Epidemiology and Prevention of Vaccine-Preventable Disease. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015.

have evidence of immunity should receive two doses, four to eight weeks apart. The vaccine may be given to anyone regardless of prior history of varicella.²⁷

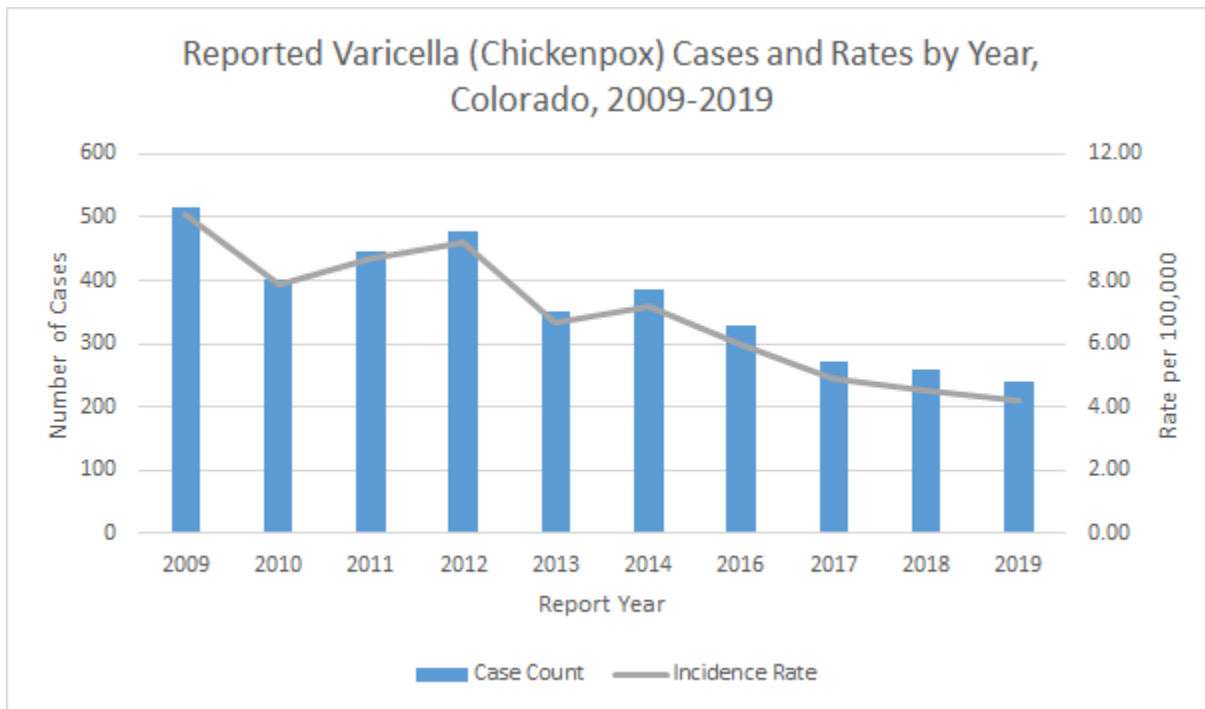


Figure 17: Overall varicella incidence rates have generally decreased over the last ten years.

²⁷ CDC. Recommendations of the Advisory Committee on Immunization Practices (ACIP). 2007 June 22; 56 (RR04); 1-40.

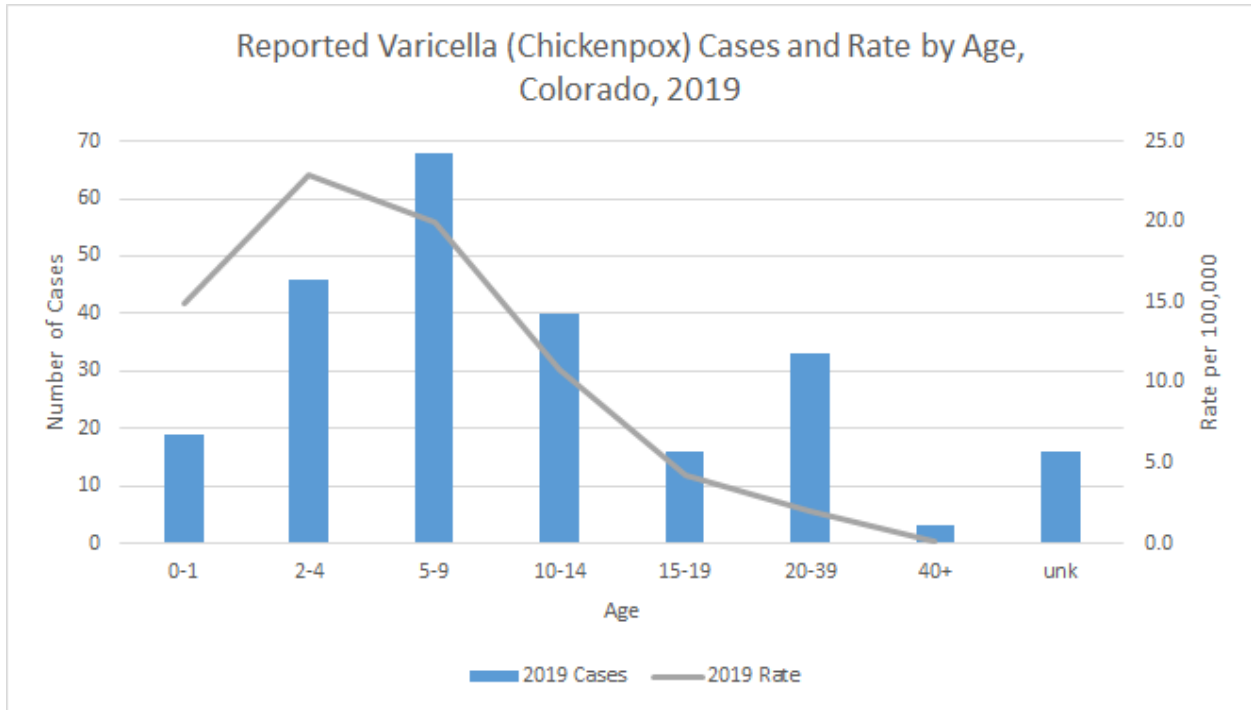


Figure 18: Due to school privacy laws, some cases of varicella are reported without identifying information, including age or date of birth. Of the 241 cases of varicella reported in 2019, 16 cases were reported with unknown age.