

# **PERTUSSIS IN NEVADA, 2004-2013**

December 2014  
Edition 1.0

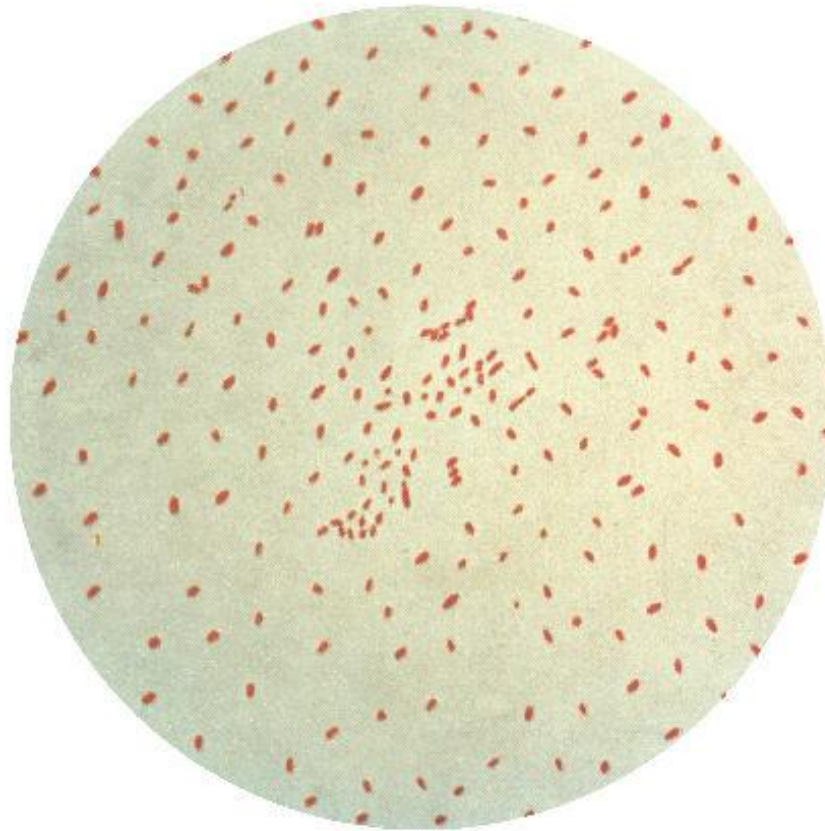


Photo: Centers for Disease Control and Prevention



**DEPARTMENT OF HEALTH AND HUMAN SERVICES**  
DIVISION OF PUBLIC AND BEHAVIORAL HEALTH  
Office of Public Health Informatics and Epidemiology

**BRIAN SANDOVAL**  
*Governor*

**RICHARD WHITLEY, MS**  
*Administrator*

**ROMANINE GILLILAND**  
*Director*

**TRACEY D. GREEN, MD**  
*Chief Medical Officer*

## Purpose

The purpose of this report is to provide a general overview of the incidence and recent trends of pertussis among Nevada residents. The report also includes Nevada data collected from cases of pertussis from 2004 to 2013. Pertussis is listed as one of Nevada's reportable diseases pursuant to [NRS 441A](#) (1). Pertussis reporting is further regulated by [NAC 441A.630](#) (2).

## Pertussis

Pertussis, commonly known as whooping cough, is a highly contagious bacterial infection of the respiratory system. Recently, the United States has seen a significant increase in the number of pertussis cases. The bacteria which cause the disease, *Bordetella pertussis*, spread from person to person, usually when an infected person sneezes or coughs and the bacteria are dispersed into the air. The bacteria attach to the cilia (hair-like extensions) that line the upper respiratory system and release toxins, damaging the cilia and causing inflammation. Pertussis is highly contagious; one person can infect up to 15 other people. Infants are most susceptible to pertussis and are most likely to have severe complications associated with the infection. About half of infants younger than one year old who get pertussis are hospitalized, and of those, 1-2% die due to this infection (3).

Symptoms of pertussis usually appear within 7-10 days of being exposed, and patients may exhibit mild cough, runny nose, mild fever, and even sleep apnea (a pause in breathing) in infants. After one to two weeks, severe coughing may begin. It is described as a rapid, violent, paroxysmic repeated cough. It is typically followed by a loud inhalation of air that sounds like a high pitched "whooping," from which whooping cough gained its name. This coughing fit can cause vomiting and extreme exhaustion. The cough has been associated with hemorrhages, broken ribs, urinary incontinence, hernias, broken blood vessels of the eyes, and facial bruising, due to the force of the coughs. Severe coughing may last for up to 10 weeks. Complications from the disease may include pneumonia, dehydration, earache, and seizures (3).

Pertussis is diagnosed by considering the history of exposure to other cases, evaluating characteristic signs and symptoms, physical examination, and collecting samples involving secretions from the back of the throat for laboratory testing. Early treatment with appropriate antibiotics is important; however, pertussis infections are often not diagnosed until after coughing fits begin. Late treatment—three or more weeks after infection—is typically not as effective as early treatment because the body has already eliminated or cleared the bacteria and ongoing coughing is probably due to lingering inflammation and damage that the bacteria has already caused (3).

Pertussis can be prevented by vaccination. It is recommended that children receive five doses of the combined vaccination for diphtheria, tetanus, and pertussis (DTaP), one dose each at ages 2, 4, 6, and 15-18 months, and 4-6 years. The DTaP vaccine is not intended for those who are 7 years of age and older (4). Adolescents and adults are recommended to receive the Tdap (tetanus, diphtheria, and pertussis) vaccine, and one dose is routinely given between the ages 11 and 12. Regardless of age, people who have not already received the Tdap vaccine are recommended to get the vaccination as soon as possible (5). To protect infants, it is recommended that families with infants and others with close contact to infants ensure they are up-to-date with their own pertussis vaccination, a secondary prevention strategy known as cocooning. It is important to stress that in infant infections, when the source of pertussis infection was identified, mothers alone were responsible for 30-40% of the infections; household members, including mothers, were responsible for 80% of infections (3).

## Summary

From 2004 to 2013, the annual number of reported pertussis cases in Nevada ranged from a low of 24 cases in 2009 to a high of 181 cases in 2013. Over the ten years, a total of 628 cases were reported. The annual crude incidence rate of pertussis ranged from a low of 0.9 cases per 100,000 population in 2009 to a high of 6.5 cases per 100,000 population in 2013, a rate that was statistically significantly higher than the previous nine years. The direct cause of this increase is not known. Pertussis incidence has been rising across the nation, and some suspect that the increase in incidence may be related to waning immunity, as the pertussis vaccine may not provide lifelong immunity as it was previously believed. The crude incidence rate from 2003 to 2013 was 2.4 cases per 100,000 population.

The Healthy People 2020 objective for pertussis is not to exceed 2,500 confirmed and probable cases among children under 1 year of age (2010 objective: not to exceed 2,000 cases) and 2,000 confirmed and probable cases among adolescents 11 to 18 years of age (no objective for this age group for Healthy People 2010), in the United States. There is no objective set in the form of a rate to compare Nevada's progress with the national target (6, 7).

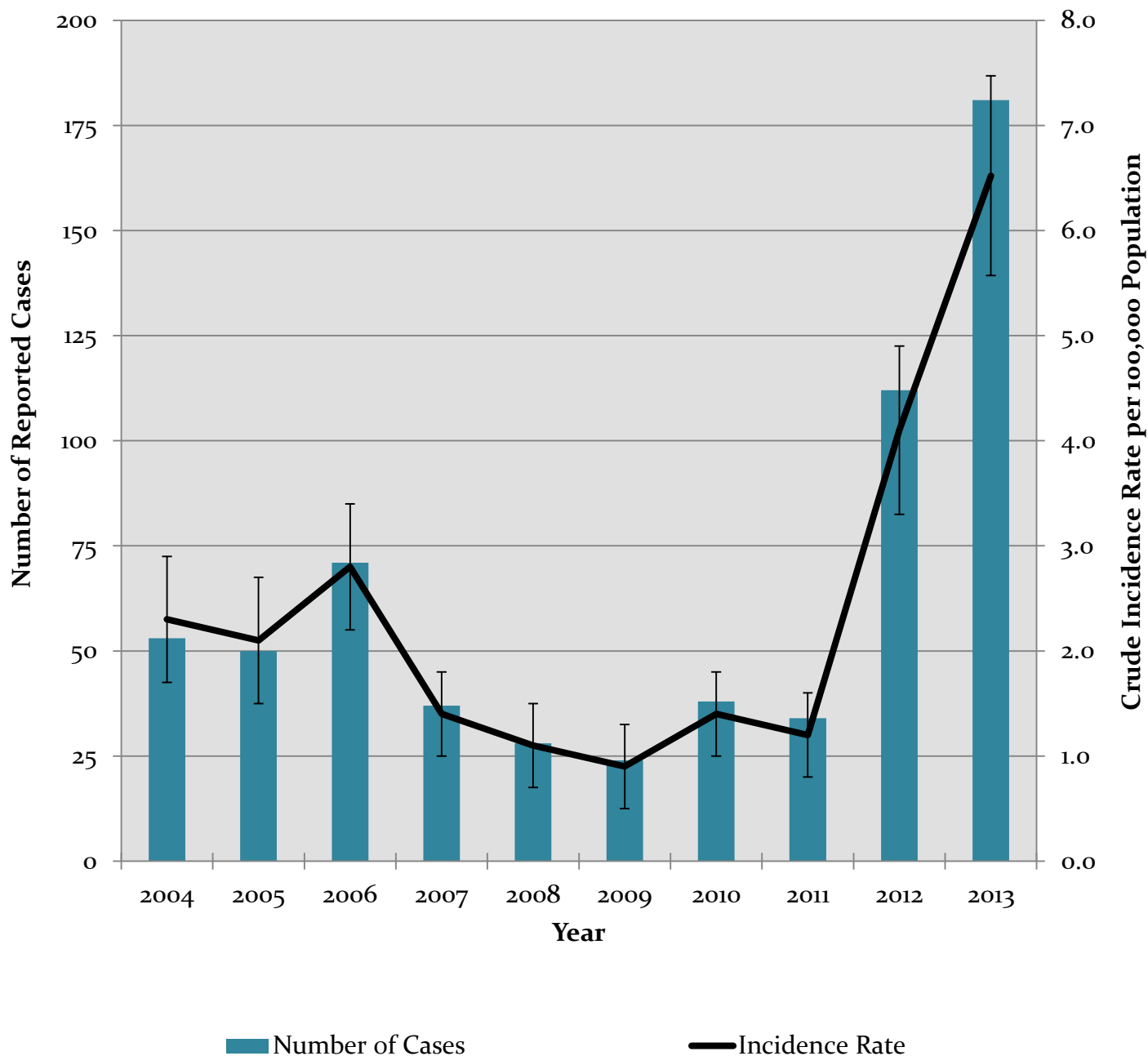
The rural and frontier counties had a significantly higher age-adjusted incidence rate (7.2 cases per 100,000 population) than all other health districts and the overall age-adjusted incidence rate for the entire state (2.4 cases per 100,000 population). Washoe County Health District also had a significantly higher age-adjusted incidence rate (3.1 cases per 100,000 population) than the state rate. In contrast, both Southern Nevada Health District and Carson City Health and Human Services had significantly lower age-adjusted incidence rates than the state rate (1.9 and 1.1 cases per 100,000 population, respectively). Differences in vaccination rates may contribute to higher susceptibility of infection in some areas, or differences in reporting may be responsible for the observed differences in rates. However, the underlying cause of the differences in incidence between health districts is not known and warrants further investigation. The rise in crude incidence for the entire state in 2012 and 2013 was largely driven by a significant increase in cases within Southern Nevada Health District (from an age-adjusted incidence rate of 1.0 cases per 100,000 population in 2011 to 4.1 and 6.5 cases per 100,000 population in 2012 and 2013, respectively).

Between 2009 and 2013, there was no discernable monthly or seasonal trend for reported pertussis infections. The number of reported cases typically ranged between 0 and 16 cases per month, except for July and August 2013, when reported cases were 29 and 37, respectively.

From 2004 to 2013, a significantly higher age-adjusted incidence rate (2.6 cases per 100,000 population) was observed among White residents compared to Blacks and Asian/Pacific Islanders (1.7 and 1.3 cases per 100,000 population, respectively). During the same time period, Asian/Pacific Islanders had a significantly lower age-adjusted incidence rate than residents of Hispanic origin (2.4 cases per 100,000 population). There were no other significant differences between other race/ethnic groups.

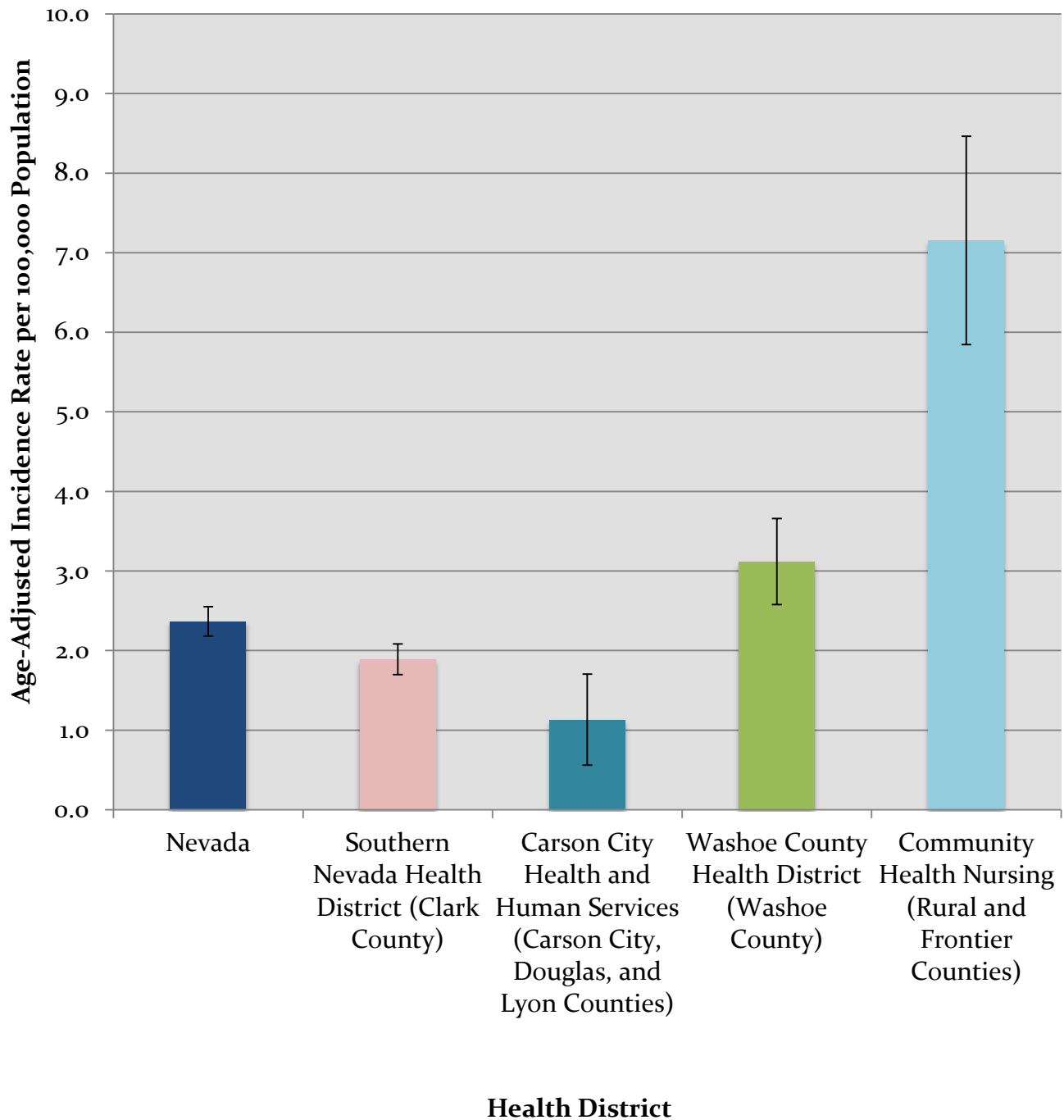
From 2004 to 2013, the highest case count of pertussis in Nevada was among infants under 1 year of age with a total of 143 reported cases during the 10-year time period. The highest case count during a single year was in children 5-14 years of age with 58 cases in 2013, but infants under 1 year of age had a significantly higher incidence rate in 2012 and 2013 (43.5 and 78.7 cases per 100,000 population, respectively) compared to all other age groups.

# Figure 1. Number of Reported Cases and Crude Incidence Rates of Pertussis in Nevada: 2004-2013

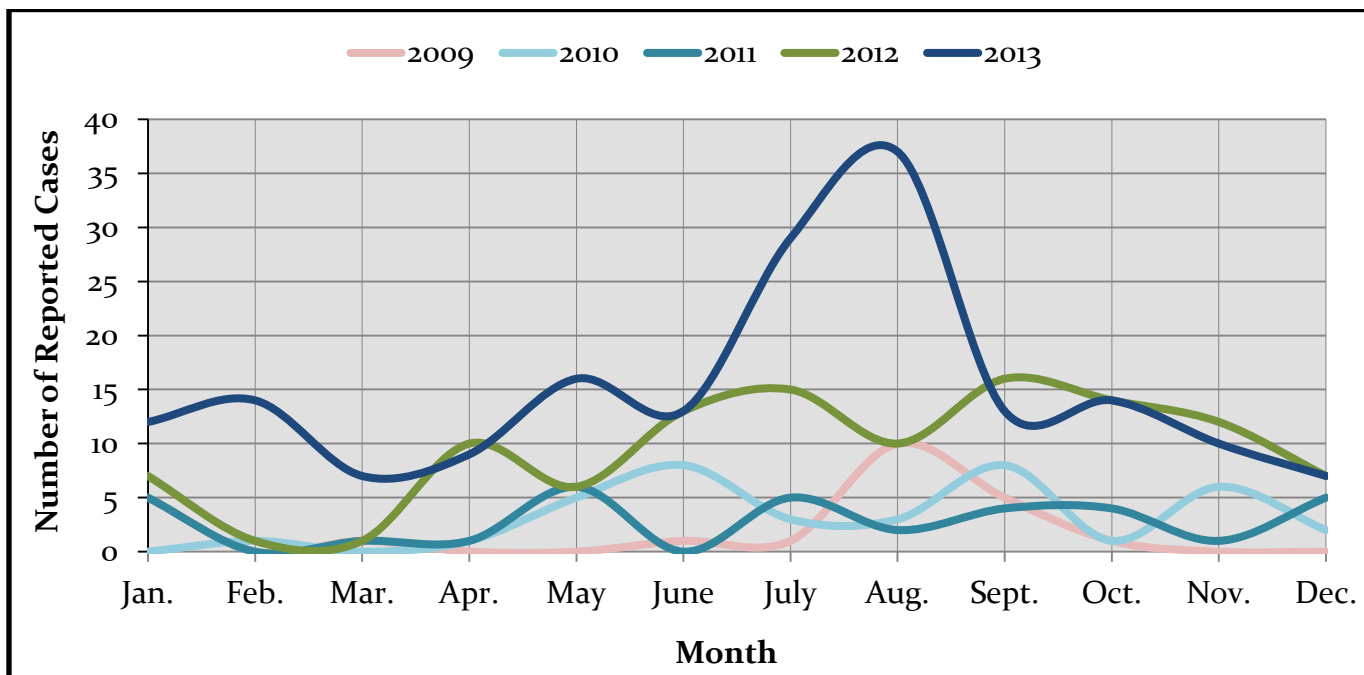


The crude incidence rate in Nevada from 2004 to 2013 was 2.4 cases per 100,000 population.

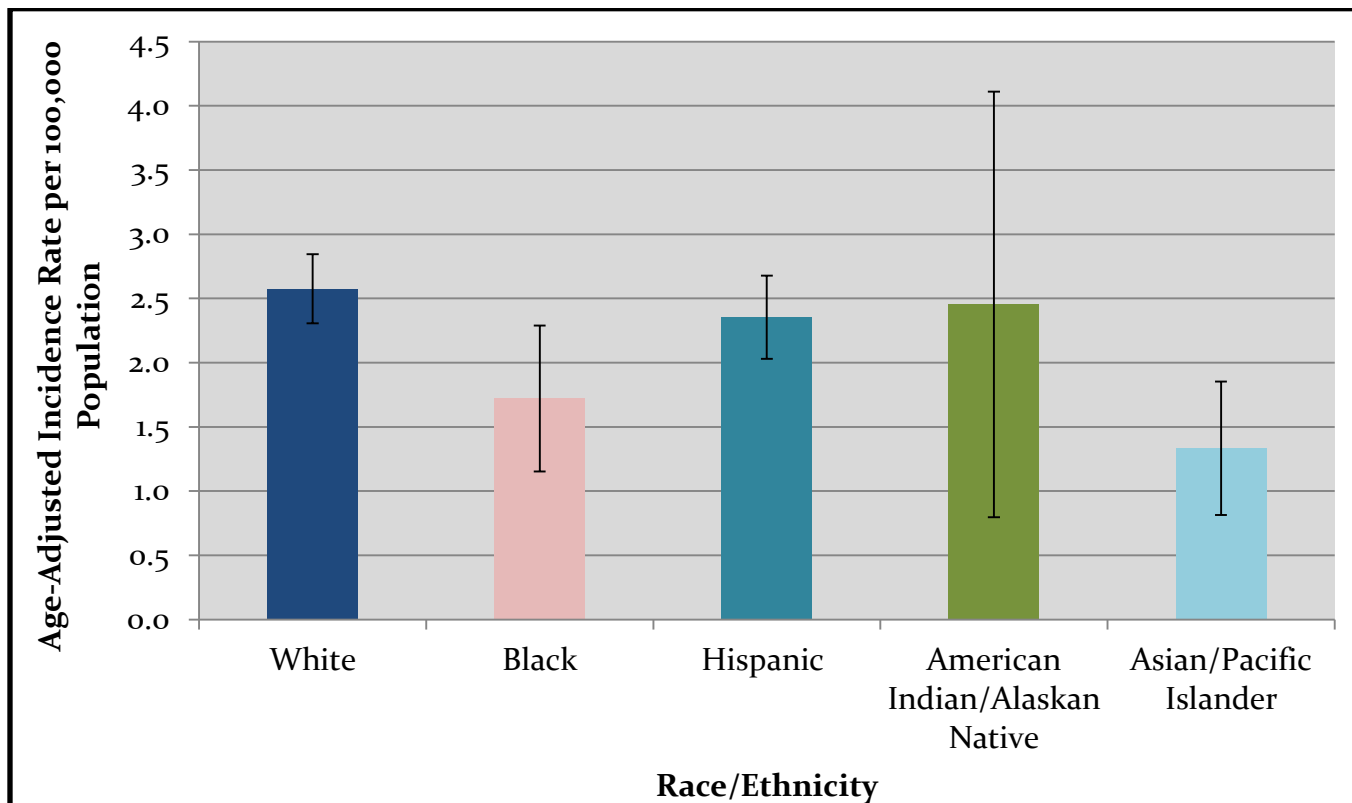
### Figure 2. Age-Adjusted Incidence Rates of Pertussis in Nevada and Nevada Health Districts: 2004-2013



### Figure 3. Number of Pertussis Cases Reported in Nevada by Month: 2009-2013



### Figure 4. Age-Adjusted Incidence Rates of Pertussis in Nevada by Race/Ethnicity\*: 2004-2013



\*If Hispanic ethnicity was reported with a race, cases were categorized as Hispanic; therefore, all races can be considered non-Hispanic.

# Figures 5A-G. Number of Reported Cases and Crude Incidence Rates of Pertussis in Nevada by Age Group: 2004-2013

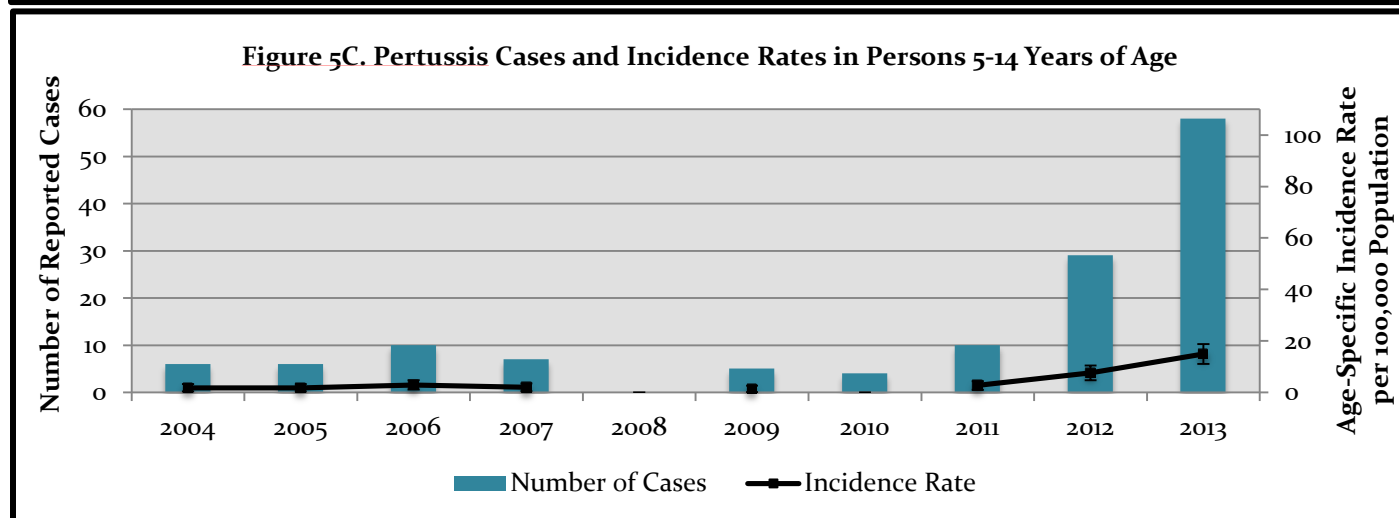
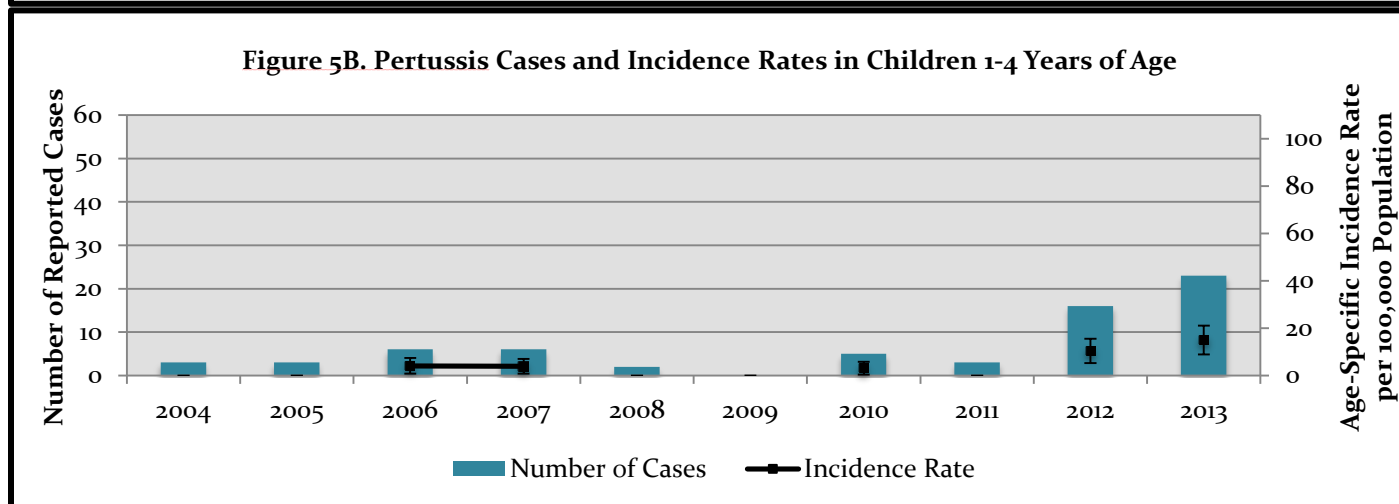
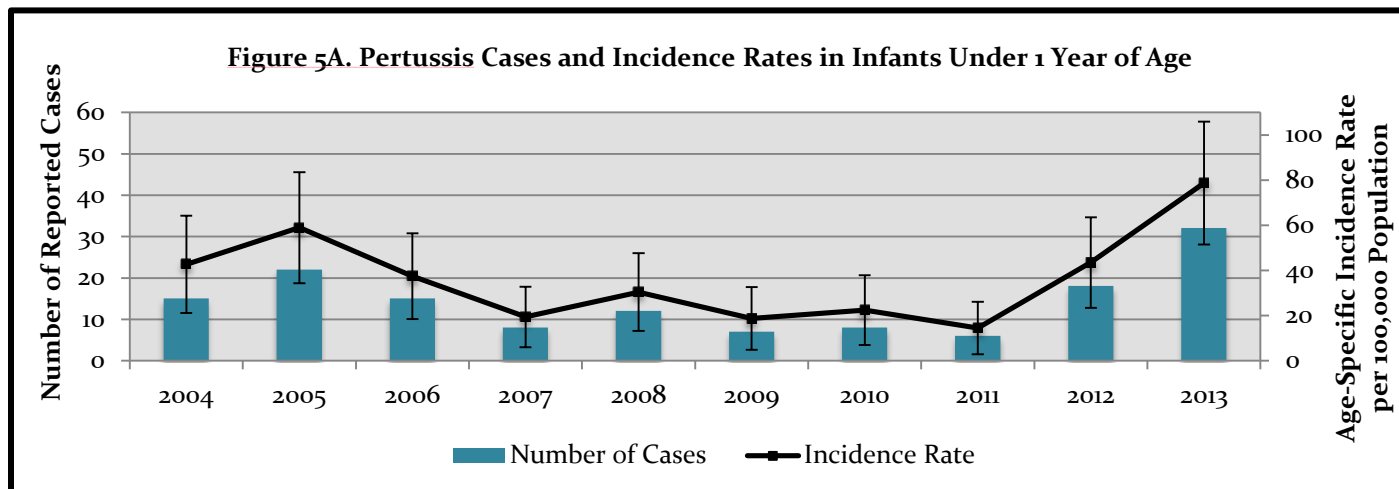


Figure 5D. Pertussis Cases and Incidence Rates in Persons 15-24 Years of Age

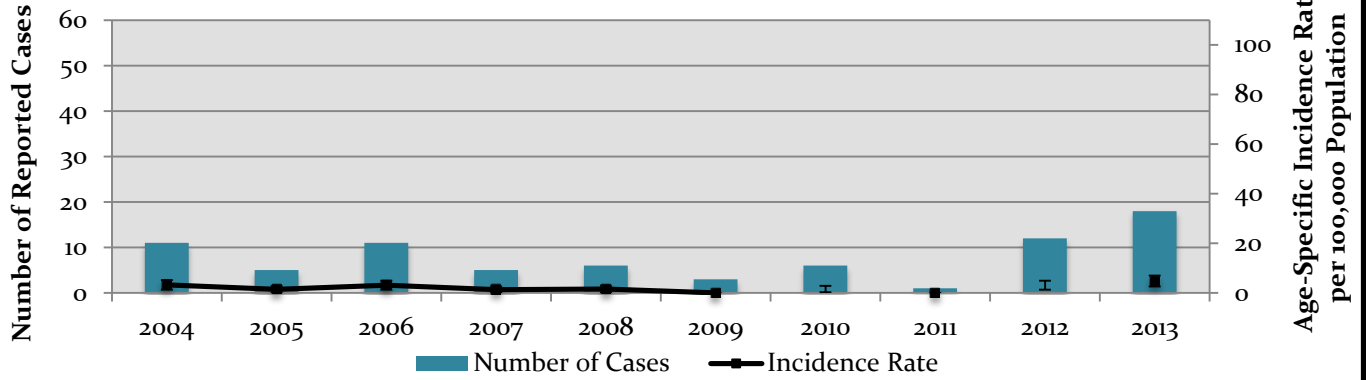


Figure 5E. Pertussis Cases and Incidence Rates in Persons 25-39 Years of Age

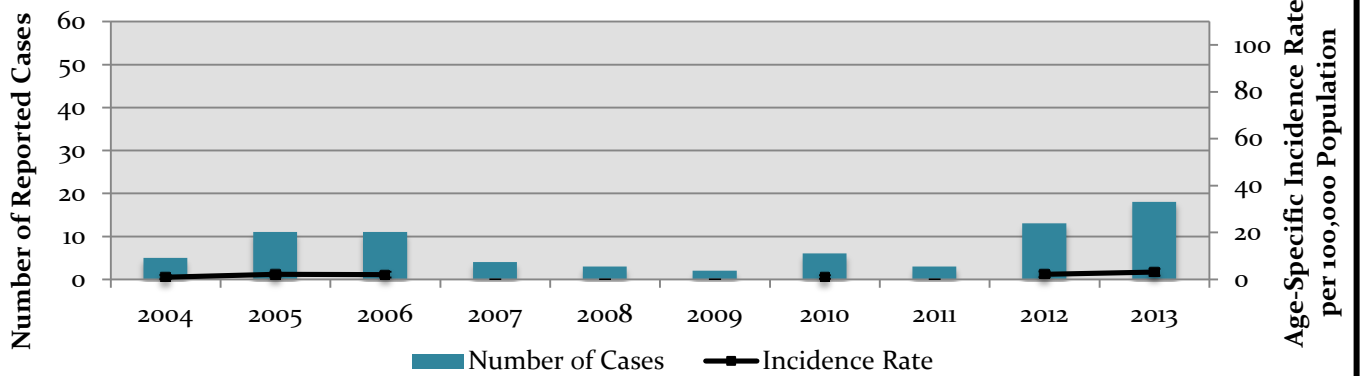


Figure 5F. Pertussis Cases and Incidence Rates in Persons 40-64 Years of Age

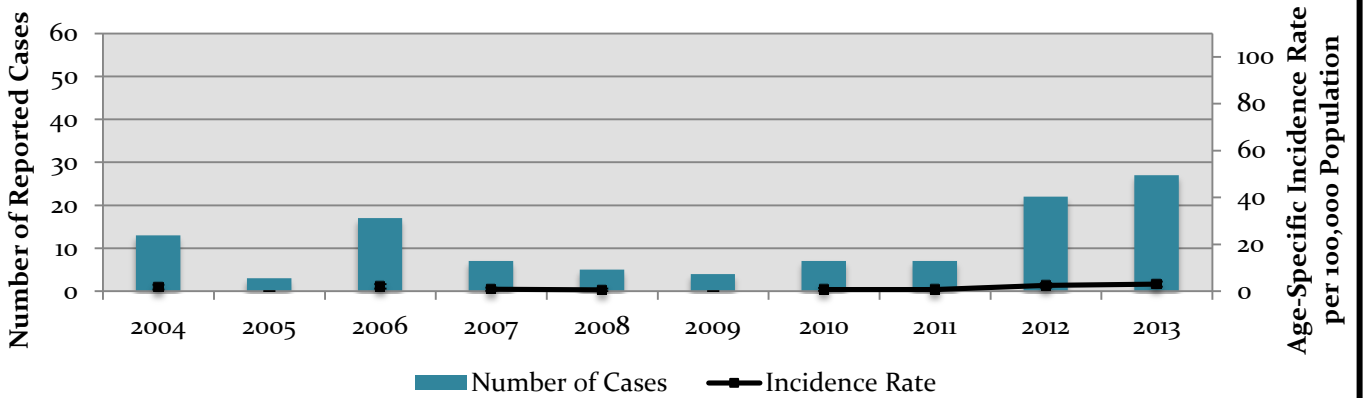
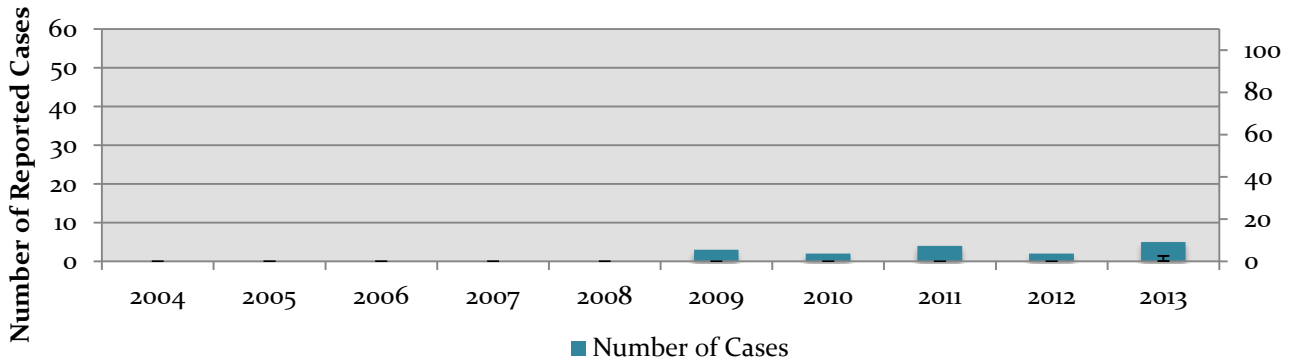


Figure 5G. Pertussis Cases in Persons 65+ Years of Age





## Technical Notes

All Nevada data from 2004 to 2013 came from reported pertussis infections within the state (8,9). The CDC and the Council of State and Territorial Epidemiologists case definition of pertussis encompasses all cases classified as probable or confirmed; all cases of pertussis used for this report follow this definition (10). Population estimates were obtained from the Nevada State Demographer's Office (11). Age-adjusted rates per 100,000 population were calculated using the year 2000 U.S. standard population. Cases with unknown ages were excluded from the age-adjusted rate calculations; 2 such cases had to be excluded. Cases with unknown race/ethnicity (103 cases) were imputed among racial/ethnic groups based upon the distribution of each racial/ethnic group within the general population. Cases with race and ethnicity listed as "other" or those with multiple races were excluded from Figure 4; 3 such cases were excluded. When used for rates, error bars represent 95% confidence intervals. The Keyfitz method was used to calculate confidence intervals of age-adjusted rates (12). Due to their inherent unreliability, rates were not calculated for case counts lower than five.

## Sources

1. Nevada Revised Statute (NRS) 441A. <https://leg.state.nv.us/NRS/NRS-441A.html>
2. Nevada Administrative Code (NAC) 441A.630. <http://www.leg.state.nv.us/nac/NAC-441A.html#NAC441ASec630>
3. Centers for Disease Control and Prevention. (2012). Pertussis. National Center for Immunization and Respiratory Diseases. Retrieved 2014-9-17. <http://www.cdc.gov/pertussis/about/index.html>
4. Centers for Disease Control and Prevention. (2007). Diphtheria, Tetanus, and Pertussis (DTaP) VIS. National Center for Immunization and Respiratory Diseases. Retrieved 2014-9-17. <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/dtap.html>
5. Centers for Disease Control and Prevention. (2013). Tdap (Tetanus, Diphtheria, Pertussis) VIS. National Center for Immunization and Respiratory Diseases. Retrieved 2014-9-17. <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/tdap.html>
6. Centers for Disease Control and Prevention. (2012). Healthy People 2010. CDC Wonder Data 2010. Retrieved 2014-02-25. <http://wonder.cdc.gov/data2010/>
7. U.S. Department of Health and Human Services. (2013). Healthy People 2020. Retrieved 2014-02-25. <http://www.healthypeople.gov/2020/default.aspx>
8. NBS. NEDSS . All counties except Clark. 2005 to 2012.
9. NETSS. All counties from 2000 to 2004 and Clark. 2005 to 2012.
10. Centers for Disease Control and Prevention. (2014). Pertussis. National Notifiable Diseases Surveillance System. Retrieved 2014-02-04. <http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=950&DatePub=1/1/2014>
11. Nevada State Demographer's Office. 2004-2013 ASRHO Estimates and Projections. Division of Public and Behavioral Health edition. Vintage 2013.
12. Keyfitz, Nathan. Human Biology. *Sampling variance of standardized mortality rates*. September 1966. 38(3): 309-17.

## Recommended Citation

Division of Public and Behavioral Health. Office of Public Health Informatics and Epidemiology. *Pertussis in Nevada, 2004-2013*. Carson City, Nevada. December 2014. e 1.0.

## Acknowledgements

Thank you to all persons who greatly contributed to this publication:  
Jennifer Thompson; Jay Kvam, MSPH; Peter Dieringer, MPH; and Stephanie Tashiro, MPH

For additional information regarding this publication, please contact:  
Office of Public Health Informatics and Epidemiology  
(775) 684-5911 [outbreak@health.nv.gov](mailto:outbreak@health.nv.gov)

This publication was supported by Cooperative Agreements 1U50OE000037-01 and 1U50CK000257-01 from the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.