Washoe County Health District

EPI - NEWS

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PERTUSSIS UPDATE IN WASHOE COUNTY
A CLOSER LOOK AT PERTUSSIS STRIKING RESURGENCE

National Statistics

Pertussis cases are reported by local/state health authorities to the Centers for Disease Control and Prevention (CDC) through the National Notifiable Diseases Surveillance System (NNDSS). Figure 1 shows the trend of reported pertussis cases from 1922 to 2013. Although case numbers fell dramatically during 1940s, 1950s, 1960s, a gradual increase began during the 1980s. Provisional data for 2013 indicates that the number of reported cases of pertussis was 24,231, corresponding an incidence rate of 7.69 cases per 100,000 population. Although incidence was lower than that reported in 2012, the incidence rate remains very high in comparison to that reported in the 1990s.

Figure 1

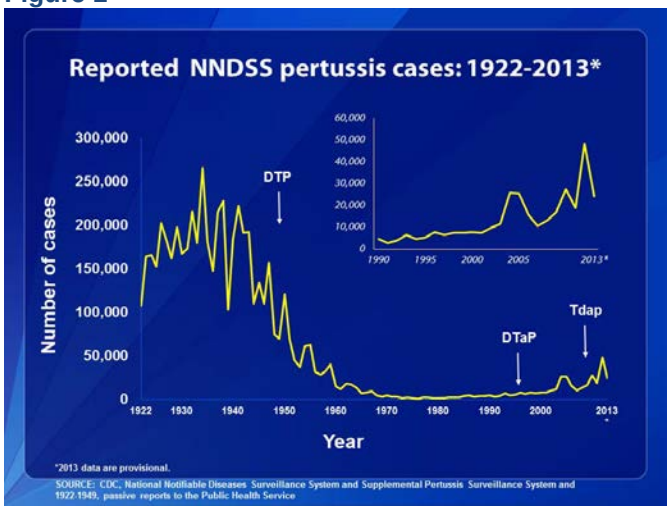
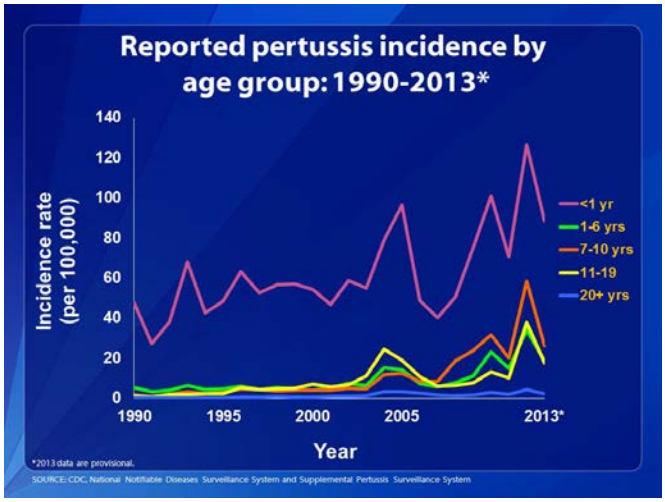


Figure 2



Overall reporting of pertussis had declined during 2013; however, Nevada is one of 16 states which have reported an increase in pertussis cases compared with the same time period during 2012. Figure 2 shows the incidence rate trend by age group. Children under one had the highest incidence rate and followed by 7-10 years age group in past few years.

Local Statistics

In Washoe County, 41 cases were reported in the first seven months of 2014 in comparison to 22 cases reported in 2013. The incidence is the highest one ever during past two decades in Washoe County (Figure 4).

Of the 41 cases reported to date in 2014, eight (8) (20%) were under 1 year old and 68% (28/41) were children under 18 years. The median age was 11 years (range: 1 month-67 years), 59% were female, and 59% (19/32) were White, non-Hispanic, 28% (9/32) were Hispanic, 6.3% (2/32) were Black, and 6.3% (2/32) were Native American. For age groups under 1 and under 18, Hispanics, Blacks, and Native Americans were disproportionally affected in comparison to their respective overall population. Five cases (12%) were hospitalized all of which were under 6 months, i.e., 5 of 8 cases (63%) under 1 were hospitalized with a median length of stay at 2 days (range: 1-9 days) and no deaths were reported. Of 36 cases with documented pertussis vaccination, 26 (72%) had appropriate pertussis containing vaccines. Of 8 cases under 1, 5 did not receive pertussis vaccine and only 1 of 5 was not eligible due to being under age for the vaccination. Eighteen (19) of 41 (39%) cases were associated with six household clusters. Cluster size ranged from 2 to 5 cases. In one cluster of 5 pediatric cases within the same household, none had ever received pertussis vaccines. Of 8 cases under 1, 3 mothers did not receive a pertussis vaccine during pregnancy or postpartum, 3 received a vaccine at delivery, 1 received a vaccine 3 months after delivery, and 1 with unknown time. A total of 188 contacts were identified and received prophylactic treatment through public health investigation, indicating a contact ratio (# of contacts / # of cases) of 4.6 (188/41). The contact ratio for cases under 1 was 7.4 (59 contacts/8 cases) and was 3.9 (129 contacts/33 cases) for remaining cases.

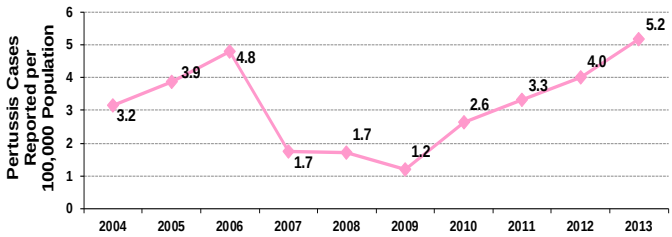
Figure 3 shows a trend of reported incidence of pertussis from 2004 to 2013. The median age of reported case was 14 years in 2012, and 12 years in 2013, and 11 years in 2014 to date.

Transmission

Transmission occurs through contact with respiratory droplets. Pertussis is highly communicable, as

evidenced by secondary attack rates of 80% among susceptible household contacts.

Figure 3. Rate of Reported Cases of Pertussis, Washoe County, 2004-2013



The basic reproductive number (R_0) is the number of secondary cases expected to be caused by a single, typical infected individual in a susceptible population. The R_0 is the primary metric used to quantify the transmission of a disease in infectious disease dynamics. The greater the R_0, the more communicable the disease is. In comparison with other infectious diseases, the R_0 for pertussis is 12-17. This is similar to the communicability of measles for which the R_0 is 12-18, higher than other well-known infectious diseases. The R_0 is 6-7 for diphtheria; 5-7 for smallpox, polio, rubella; 4-7 for mumps; 2-5 for HIV and SARS; 2-3 for influenza.

Pertussis Resurgence – Likely Contributing Factors

Based on recently published peer-reviewed articles addressing pertussis outbreaks as well as local data, factors likely contributing to pertussis resurgence can be summarized as follows:

- Waning of immunity and redevelopment of susceptibility within the birth cohorts of children vaccinated with acellular vaccines (DTaP, Tdap), even in the face of recent booster doses. Studies indicated that the protection of DTaP waned to <90% after 3 years and was 71% by ≥ 5 years. [1] Studies also estimated Tdap vaccine effectiveness declined from 75% to 41%, respectively, <1 and ≥2 years after vaccination. [2]
- Pertactin is one of several components of all pertussis vaccines. It is a protein that helps pertussis bacteria attach to the lining of the airways. A recent published paper evaluated the prevalence of pertactin-deficient strains in the United States. The study indicated that the prevalence of pertactin-deficient isolates increased substantially to more than 50% of collected isolates in 2012. The result indicates that there has been a recent dramatic increase in pertactin-deficient *Bordetella pertussis* isolates through the United States. Although pertactin is an important part of the vaccines, current evidence suggests pertussis vaccines continue to prevent disease caused by both pertactin-positive and pertactin-negative strains since other components of the vaccines provide protection.
- With more recent outbreaks in California, Washington State, awareness of this disease among healthcare providers has been increased significantly. Ordering appropriate PCR test for pertussis diagnosis by pediatricians has been increased significantly. More than 50% of reported cases this year were lab-confirmed in comparison to a smaller proportion of cases being lab-confirmed in previous years.

Tdap Vaccination of Pregnant Women

Although most children have been vaccinated and some of them still become infected due to waning immunity from acellular vaccine. A recent published article also concluded that vaccinated cases of pertussis had decreased morbidity characterized by less severe illness and significantly reduced illness duration. [3] Therefore, healthcare providers should follow the current immunization schedule for their patients. Please refer to 2014 ACIP recommendation for detailed schedules at CDC's website http://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html

In 2013, nine infant pertussis deaths were reported in the nation. All nine were under three months of age. In Washoe County to date, all five hospitalized cases were in infants under 1 year. Of seven infant cases with known maternal Tdap history, none of them had the Tdap vaccination during 27-36 weeks gestation recommended by the Advisory Committee on Immunization Practices (ACIP) and the American College of Obstetrics and Gynecology (ACOG). Washoe County Health District highly encourages that all healthcare providers who provide perinatal care should consider offering Tdap vaccination to pregnant women during **EACH** pregnancy regardless of their vaccination history and this should be prioritized. It is hoped that transplacentally transferred antibodies will protect young infants against pertussis until they are old enough to be immunized. To maximize the maternal antibody response and passive antibody transfer to the infant, optimal timing for Tdap administration is between **27 and 36 weeks gestation**[4]. Adults of all ages (e.g., parents, grandparents, child care providers, healthcare personnel) in contact with infants under the age of one should receive a single dose of Tdap.

The most important strategy to prevent infection in vulnerable infants is Tdap vaccination of pregnant women and this should be prioritized. Optimal timing for Tdap administration is between 27 and 36 weeks gestation. [4] To report a case, call WCHD at 775-328-2447 or fax 775-328-3764.

[1] Thomas A. clark. Changing Pertussis Epidemiology: Everything Old is New Again. JID 2014:209 (1 April)

[2] Koepke et al. Estimating the effectiveness of Tdap for Preventing Pertussis: Evidence of Rapidly Waning Immunity and Difference in Effectiveness by Tdap Brand. DOI:10.1093/infdis/jiu322.

[3] Barlow et al. Vaccinated Children Adolescents with Pertussis Infections Have Decreased Illness Severity and Duration, Oregon 2010-2012. Clinical Infectious Diseases Advance Access Published March 14, 2014.

[4] MMWR. February 22, 2013, Vol. 62, No. 7