

Streptococcus pneumoniae in Washoe County, 2004-2009

BACKGROUND

Drug-resistant *Streptococcus pneumoniae* (DRSP) is one of the most serious infectious health threats currently challenging health care providers. In Nevada, pneumococcal meningitis is reportable by law. However, the true incidence of invasive disease caused by *Streptococcus pneumoniae* (SP), other than pneumococcal meningitis, is not known. Laboratory-based reporting of SP can be used to supplement the existing surveillance system. The Washoe County Health District (WCHD) began conducting laboratory-based surveillance for SP on June 1, 2003.

The objectives of SP surveillance are:

- ◆ To track the incidence of invasive SP infection and determine the true disease burden in the community.
- ◆ To track the incidence of invasive DRSP infection.
- ◆ To track the antibiotic susceptibility by population and selected characteristics (specimen sources).
- ◆ To assist health care providers to select effective antimicrobial therapy to treat patients.
- ◆ To track the coverage rate with Prevnar™ vaccine among lab-confirmed cases under 5 years of age.

METHODS

Surveillance Case Definition

SP must be isolated from a sterile or non-sterile body site of a patient who is a resident of Washoe County. A case is considered to have **invasive** pneumococcal infection if the SP is isolated from a normally sterile site (e.g., blood, cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid).

Reporting Requirement

In Washoe County, laboratories are required to report all SP isolates from any body site in a person residing in Washoe County -- including antibiotic susceptibility test results. The report must include the patient's identifying and demographic information, date of specimen collection, source of specimen, specimen number and antibiotic susceptibility test results.

Surveillance Method

This surveillance system is primarily laboratory-based. The system is enhanced by adding active investigation of vaccination history among cases under 5 years of age. Vaccination histories are obtained from the statewide immunization registry. If vaccination history for a case is not in the registry, a WCHD staff member calls the child's parents to determine the child's Prevnar™ vaccination status. Effective in 2007, additional investigation through medical chart review among cases with invasive infection was conducted and is ongoing. The purpose of this investigation is to identify type of infection, severity of infection, and patient outcome.

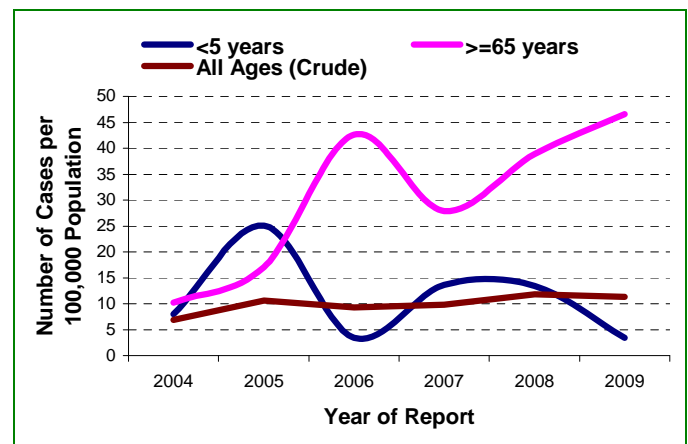
Surveillance Period

Surveillance for SP started on June 1, 2003, and is ongoing.

RESULTS

Because data for the entire year in 2003 is not available, the results reported in this article are based on data from 2004 through 2009.

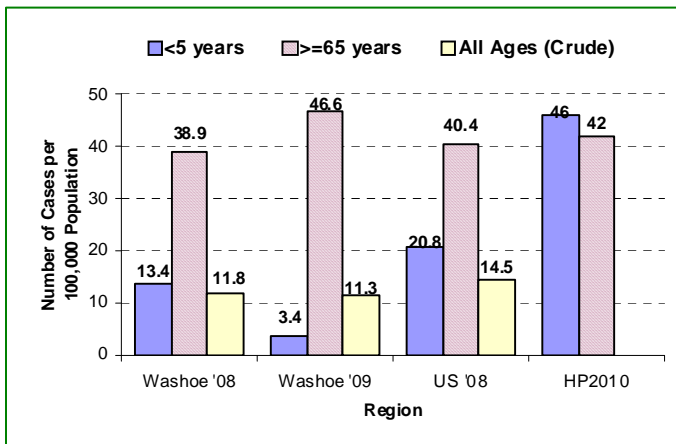
Figure 1A. Incidence of Invasive Pneumococcal Diseases (IPD), Washoe County, 2004-2009.



A total of 47 cases were reported in Washoe County in 2009, of which, one (1) case was a child under five (5) years of age and 20 cases were among persons 65 years of age or older. **Figure 1A** shows the trend of reported incidence of invasive pneumococcal infection

between 2004 and 2009. **Figure 1B** illustrates the Healthy People 2010 national health objective for invasive pneumococcal infection has been reached among children under five (5) years of age but not among persons 65 years or older in 2009. In Washoe County, the incidence among children under 5 years of age in 2008 was below the 2008 national rate. The overall crude incidence of invasive pneumococcal infection in Washoe County was below the national rate. At the time of this report preparation, national statistics for 2009 were not available.

Figure 1B. Incidence of Invasive Pneumococcal Diseases (IPD), Washoe County, 2009.*



*Data source: Washoe County's National Electronic Disease Surveillance System (NEDSS) & www.cdc.gov/abcs.

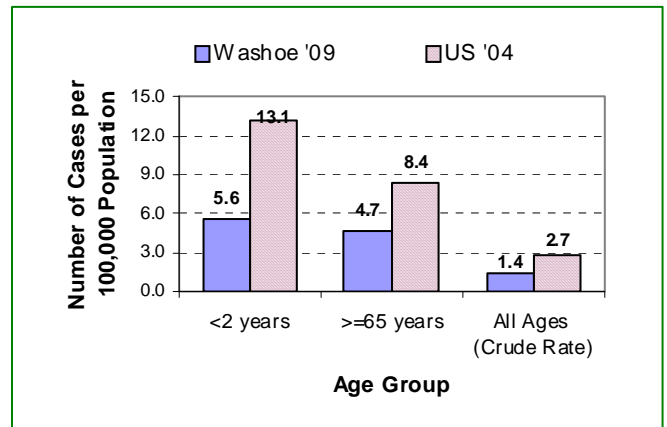
In 2009, there were six (6) reported cases of invasive disease caused by DRSP in Washoe County. Two cases were over 65 years of age and one was under two years of age.

The incidence of invasive DRSP infection is shown in **Figure 2**. A recent national incidence rate for DRSP was not available at the time of this report preparation.

Figure 3 shows the trend of antibiotic susceptibility of all reported *SP* isolates during 2004 and 2009. This overall increase in antibiotic susceptibility, i.e., reduction in resistance, was likely associated with the introduction of pneumococcal conjugate vaccine in 2000. This trend was consistent with other national and international studies (*N Engl J Med* 2006;354: 1455-63; *N Engl J Med* 2006;354:1522-24; *Clinical Infectious Disease* 2008;46:174-182). It is important to note that susceptibility to Trimethoprim/Sulfa was reduced in 2008 and 2009. It is also important to note that penicillin susceptibility of *SP* isolated from children under five years of age is the lowest in comparison to other age groups (data not shown). This may suggest that

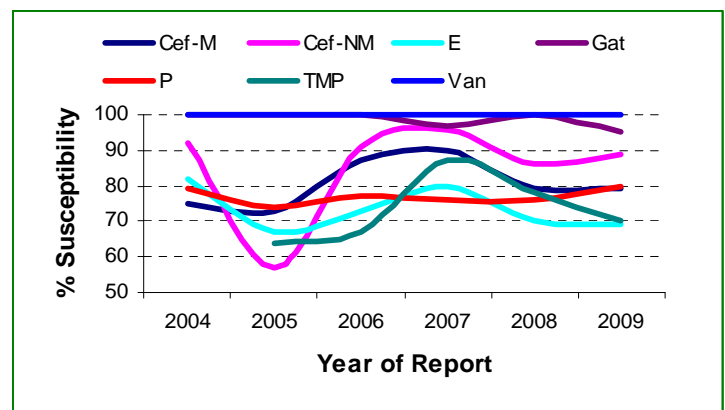
antibiotics should be used more judiciously among the pediatric population.

Figure 2. Incidence of Invasive Pneumococcal Diseases Caused by DRSP, Washoe County, 2009.*



*DRSP is defined as an *SP* isolate with resistance or intermediate resistance to penicillin. Data source for national statistics: *N Engl J Med* 2006;354:1455-63.

Figure 3. Trend of Antibiotic* Susceptibility of Reported *SP* Isolates, Washoe County, 2004-2009.



* Cef-M=Cefotaxime (meningitis breakpoints); Cef-NM= Cefotaxime (non-meningitis breakpoints); E=Erythromycin; Gat=Gatifloxacin; P=Penicillin; TMP=Trimethoprim/Sulfa; Van=Vancomycin.

The multi-drug resistance (MDR) rate was also monitored. An isolate is classified as MDR if it is not susceptible to two or more antibiotics. The MDR rate significantly increased from 7% (14/204) in 2004 to 16.1% (36/224) in 2009. Beginning in 2010, the MDR rate will be evaluated using CDC's surveillance definition for multi-drug resistant organism (MDRO).

Syndromes, Length of Hospitalization, and Outcome

Effective 2007, additional investigation by reviewing medical charts for those cases whose isolate(s) were from sterile body sites provided a more comprehensive picture of invasive pneumococcal infections. The

Please share this document with all physicians & staff in your facility/office.

following table lists numbers of reported IPD by types of infections as well as their severity during the past three years. Only about 10% of IPD had meningitis and about 70% of cases had pneumonia with pneumococcal bacteremia.

Type of Invasive Infections	2007 # (%)	2008 # (%)	2009 # (%)	Total # (%)
Pneumonia with bacteremia	27 (66)	35 (70)	36 (77)	98 (71)
Bacteremia without focus	9 (22)	6 (12)	7 (15)	22 (16)
Meningitis	2 (5)	6 (12)	4 (9)	12 (9)
Others	3 (7)	3 (6)	0 (0)	6 (4)
Total	41 (100)	50 (100)	47 (100)	138 (100)
Hospitalized due to the illness	34 (83)	48 (96)	40 (85)	122 (88)
Median length of stay*	4 (1-30)	6 (1-40)	5.5 (1-90)	
Fatal cases	4 (10)	6 (12)	6 (13)	16 (12)
Median age for fatal cases*	53 (40-66)	67 (26-88)	76 (49-97)	
Underlying conditions in fatal cases	3 (75)	6 (100)	6 (100)	15 (94)

* numbers in () refer to the ranges of value not %

During 2007-2009, 88% of reported cases were hospitalized due to the IPD. The median length of hospital stay was four (4) days in 2007, six (6) days in 2008, and 5.5 days in 2009. The range was very wide from 1 day to 90 days. Sixteen cases were fatal, which accounted for 12% of cases. The age range for the fatal cases was wide from 40 years old to 97 years old. Ninety-four (94%) of fatal cases had underlying conditions such as COPD, cardiovascular disease, diabetes, alcohol use, and obesity. Data on causes of death will be collected beginning in 2010 to further evaluate whether pneumococcal infections are a contributory or causal factor for the death. It is fortunate to note that there were no fatal cases as a result of IPD among children under five during the past three years.

Vaccination Status among Children Under 5 Years of Age, Washoe County, 2004-2009.

◆ During the four year period between 2004-2007, SP infections were reported in 167 children under 5 years of age. WCHD staff were able to investigate the vaccination status of 131 (67%) of these children. Sixty two (62%) percent of the cases investigated had received Prevnar™ (1-4 doses) and 30% had not. **Effective on October 31, 2007, children enrolled in a childcare facility in Nevada must have vaccination against Streptococcus pneumoniae.** During the two year period between 2008-2009, SP infections were reported in 121 children under 5. WCHD staff were able to investigate the vaccination status of 85 (70%) of these children. Ninety-three (93%) percent of the

cases investigated had received Prevnar™ (1-4 doses) and 7% had not. Although this percentage may not represent the coverage rate among the general population, this significant increase in Prevnar coverage among reported cases is likely associated with the state regulation change in October 2007.

◆ A total of 19 cases of IPD were reported among children under 5 years of age during the six years (2004-2009) combined. The vaccination status for 15 of these cases was available. Eleven of 15 cases (73%) had been vaccinated and four (27%) had not. These data could signal that new serotypes of SP not covered by Prevnar™ are emerging. Laboratory tests, not currently available in Nevada, are needed to determine if SP serotypes isolated in Washoe County are those included in the vaccine. A recently published article by CDC concluded that *“IPD among children aged <5 years in the United States decreased by 76%; however, IPD from non-PCV7 serotypes, particularly 19A, has increased”*.¹

A Newly Licensed 13-Valent Pneumococcal conjugate vaccine (PCV13)

- ◆ In February 2010, the Advisory Committee on Immunization Practices (ACIP) issued recommendations for use of a newly licensed 13-valent pneumococcal conjugate vaccine (PCV13, Wyeth Pharmaceuticals Inc.). PCV13 succeeds PCV7, which was licensed by FDA in 2000. PCV13 contains the seven serotypes in PCV7 (4, 6B, 9V, 14, 18C, 19F, and 23F) and six additional serotypes (1, 3, 5, 6A, 7F, and 19A).¹
- ◆ ACIP suggests 1) routine vaccination of all children aged 2-59 months with PCV13; 2) vaccination with PCV 13 of children aged 60-71 months with underlying medical conditions that increase their risk for pneumococcal disease or complications; 3) PCV13 vaccination of children who previously received 1 or more doses of PCV7.



We would like to thank Renown Regional Medical Center Clinical Laboratory, Saint Mary's Regional Medical Center Clinical Laboratory, VA Medical Center Clinical Laboratory, Northern Nevada Medical Center Clinical Laboratory, Quest Diagnostics, Inc., and LabCorp for their excellent reporting and cooperation with this surveillance program.

¹ CDC. Invasive Pneumococcal Disease in Young Children before Licensure of 13-Valent Pneumococcal Conjugate Vaccine – United State, 2007. Morbidity and Mortality Weekly Report. March 12, 2010.

Please share this document with all physicians & staff in your facility/office.