



Streptococcus pneumoniae in Washoe County, 2003-2005

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 District Health Department Epi Center 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 drugs to treat patients.
- ◆ To track the coverage rate with Prevnar™ vaccine among 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.

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 data for a case are not in the registry, an Epi Center staff member calls the child's parents and requests his Prevnar™ vaccination status.

Surveillance Period

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

RESULTS

Because data for the entire year 2003 were not available, the results for incidence and antibiotic susceptibility will focus on 2004 and 2005. The data for vaccination among children under 5 years of age are based on the surveillance period between July 1, 2003, and December 31, 2005, using the date of specimen collection.

Table 1. Demographics of Reported SP Cases, Washoe County, 2004-2005.

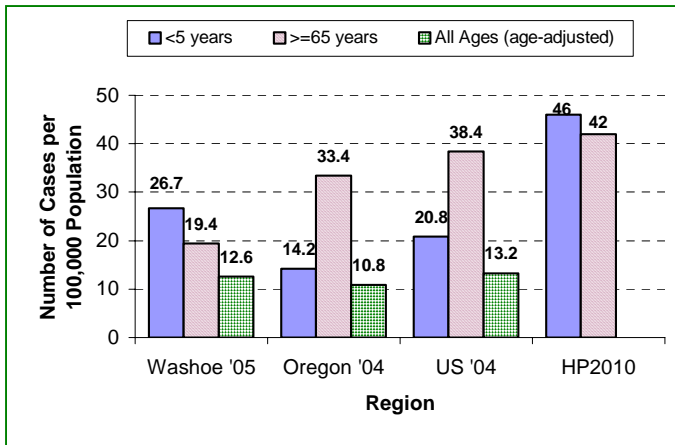
Characteristics		2004 # (%)	2005 # (%)
Total # of Isolates		210	184
Total # of Individuals*		191	173
Age Group	< 5 yrs	41(21%)	38(22%)
	≥ 65 yrs	47(25%)	44(25%)
	Others	96(50%)	89(51%)
	Missing	7(4%)	2(1%)
Gender	Male	101(53%)	103(60%)
	Female	88(46%)	70(40%)
	Missing	2(1%)	
Race/ethnicity	White, nH	95(50%)	111(64%)
	Other	19(10%)	16(9%)
	Unknown	77(40%)	46(27%)

*If a patient had more than one isolate in one year, only the first isolate was counted. nH = not Hispanic

Table 1 illustrates that pneumococcal infections disproportionately affect children under 5 years of age (22% of cases) and the elderly (25% of cases). These

two groups accounted for 6.7% and 10%, respectively, of the entire population in 2005.

Figure 1. Incidence of Invasive Pneumococcal Infection, Washoe County, 2005.*



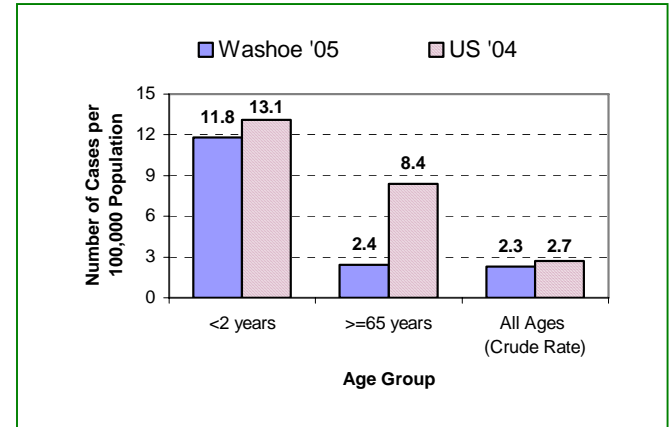
*Data source: www.cdc.gov/abc and www.oregon.gov/DHS/ph/acd/diseases/pneu/spnyr.pdf. Oregon - Portland Tri-County; US - Active Bacterial Core Surveillance of the Emerging Infections Program Network. Data for 2005 for Oregon and the US are not available. The US year 2000 standard population is used for calculating age-adjusted incidence rates. Age-adjusted rates for Oregon and the US were calculated by Epi Center staff based on the number of cases and the age group-specific incidence rates published on the websites.

Figure 1 illustrates the Healthy People 2010 national health objectives for invasive pneumococcal infection have been reached. In Washoe County, invasive infections among children under 5 years of age were above the 2004 national rate. The age-adjusted overall incidence of invasive pneumococcal infection in Washoe County was below the national rate, but higher than a neighboring state. Oregon is one of 11 sites for CDC's Emerging Infections Program. It is important to point out that two cases of invasive disease were reported in 2004 among children under 5 years old; and seven cases in the same age group were reported in 2005. Of seven cases, four were under 24 months old.

In 2005, there were nine reported cases of invasive disease caused by DRSP in Washoe County. Two cases were under 2 years old; two were under 5 years old, and one was over 65 years old. Of note is the relatively low rate of invasive pneumococcal disease in Washoe County residents over age 65. We would like to attribute this achievement to the Northern Nevada Immunization Coalition and its tireless promotion of pneumococcal vaccination for our senior citizens (but under-reporting is always a possibility).

The incidence of invasive DRSP infection is shown in Figure 2.

Figure 2. Incidence of Invasive Pneumococcal Infection Caused by DRSP,* Washoe County, 2005.



*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).

Table 2. Antibiotic Susceptibility of Reported SP Isolates, Washoe County, 2004-2005.

Antibiotics	2004		2005	
	# Tested	% S*	# Tested	%S*
Cefotaxime**	63	75	77	73
Cefotaxime***	63	92	77	57
Erythromycin	62	82	79	67
Gatifloxacin	78	100	89	100
Levofloxacin	31	100	14	100
Penicillin	204	79	179	74
Trimethoprim/sulfa	NA	NA	11	64
Vancomycin	81	100	81	100

* S = Susceptible
 ** Cefotaxime (meningitis breakpoints)
 *** Cefotaxime (non-meningitis breakpoints) by the National Committee for Clinical Laboratory Standards (NCCLS) 2002.
 NA = Not Available

Table 2 shows susceptibility to macrolides (erythromycin) decreased significantly between 2004 and 2005. Monitoring susceptibility to trimethoprim/sulfa should continue because only 11 isolates were tested. 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 at the same time. The MDR rate significantly increased from 7% (14/204) in 2004 to 14% (25/179) in 2005. Although susceptibility to penicillin decreased from 79% in 2004 to 74% in 2005, the Washoe County community-wide antibiogram showed an actual improvement in susceptibility from a low of 67% in 2001. This overall increase in susceptibility/decrease in resistance was associated with the introduction of pneumococcal conjugate vaccine in 2000. This trend was consistent with other national studies (*N Engl J Med* 2006;354: 1455-63 and *N Engl J Med* 2006;354:1522-24).

Table 3. Penicillin Susceptibility of *SP* Isolates by Selected Characteristics, Washoe County, 2004-2005.

Characteristics		2004	2005
		# Tested (%S)	# Tested (% S)
Age Group*	<5 yrs	40(60%)	37(43%)
	≥ 65 yrs	47(74%)	44(84%)
	Others	93(89%)	86(79%)
Gender*	Male	101(78%)	101(71%)
	Female	83(80%)	67(75%)
Race & Ethnicity*	White	94(79%)	107(75%)
	Others	19(84%)	16(75%)
Specimen Type**	Sterile Sites	38(87%)	49(84%)
	Non-Sterile Sites	166(77%)	130(70%)

*Individual based. If a patient had more than one isolate in one year, only the first isolate was counted. ** Isolate based.

Table 3 shows penicillin susceptibility is lowest among children under 5 years old; and lower in specimens from non-sterile sites. This could indicate that penicillin resistance is higher in non-invasive pneumococcal infections. There was no significant difference in penicillin resistance by gender or race/ethnicity.

Vaccination Status Among Children Under 5 Years of Age, Washoe County, 7/1/2003-12/31/2005.

- ◆ During 2 ½ years of surveillance, *SP* infections were reported in 105 children under 5 years old. The Epi Center was able to investigate the vaccination status of 59 (56%) of these children. Nearly two-thirds of the cases investigated had received Plevnar™ (1-4 doses) and one third had not. Increased coverage with Plevnar™ among children in this age group is greatly needed.
- ◆ Nine cases of invasive disease (two isolates from CSF and seven isolates from blood) were reported among children under 5 years old in 2004 and 2005 combined. Only five of nine had been vaccinated. Two meningitis cases had not received Plevnar™ and one child between the ages of 1 and 2 years died of the disease. Again, this shows the importance of vaccination.
- ◆ In 2004, none of 16 children who had received Plevnar™ developed invasive infections. In 2005, four of 18 children (22%) who had received Plevnar™ developed invasive infections. These data could signal that new serotypes of *SP* not covered by Plevnar™ are emerging. Laboratory tests, not currently available, are needed to determine if *SP* serotypes isolated in Washoe County are covered by the vaccine. A recently published study (*N Engl J Med* 2006;354: 1455-63) found an increase in disease caused by *SP* serotype 19A -- from 2.0

cases in 1999 to 8.3 cases in 2004 per 100,000 children under 2 years of age. This serotype is not included in Plevnar.™

HIGHLIGHTS OF FINDINGS

- ◆ In 2005, the Healthy People 2010 national health objectives for invasive pneumococcal infection were reached in Washoe County, but incidence among children under 5 years old was above the 2004 national rate. The incidence of invasive DRSP infection was slightly below the 2004 national rate.
- ◆ Clinicians should be aware that one of four isolates is not susceptible to penicillin; and one in three isolates is not susceptible to erythromycin in vitro. Susceptibility to erythromycin significantly decreased from 82% in 2004 to 67% in 2005. The proportion of MDR isolates doubled -- from 7% in 2004 to 14% in 2005. Judicious use of antibiotics, especially in the outpatient setting, is key to reducing resistance.
- ◆ Plevnar™ coverage should be improved among children under 5 years of age, especially in child care settings. The coverage for this age group in Washoe County was only 67%.
- ◆ A recently published study showed an increase in disease caused by a *SP* serotype not covered by Plevnar.™ Local data show that between 2004 and 2005 there was an increase in the proportion of cases who had received vaccine and developed invasive infections. Laboratory capacity must be developed to determine if the isolated *SP* serotype is covered by Plevnar.™

LIMITATIONS OF THE DATA

- ◆ No clinical data were solicited. In specimens from non-invasive disease cases, *SP* could have been part of a mixed culture, or an incidental finding. Therefore, the true etiology of **non-invasive** disease was unknown.
- ◆ Reporting is not required by Nevada law but is required by the District Health Officer, so under-reporting may exist. The incidence of invasive infection might be underestimated.
- ◆ A small proportion of reports were missing the patient's address. These cases were excluded from the final data analysis, which might result in under-estimating true morbidity. This effect was very minimal.
- ◆ Because the surveillance is laboratory-based, fatal outcomes are not determined unless the case had pneumococcal meningitis. A complete case history is solicited in these cases.

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