Streptococcus pneumoniae Surveillance Report 2006

Oregon Active Bacterial Core Surveillance (ABCs)
Office of Disease Prevention & Epidemiology
Oregon Department of Human Services
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Background

Active Bacterial Core surveillance (ABCs) is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). The purpose of ABCs is to determine the incidence and epidemiologic characteristics of invasive disease due to *Haemophilus influenzae*, *Neisseria meningitidis*, group A *Streptococcus* (GAS), group B *Streptococcus* (GBS), and methicillin-resistant *Staphylococcus aureus* (MRSA). The entire EIP Network represents 39.5 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/ncidod/dbmd/abcs.

In Oregon, the surveillance area for invasive pneumococcal disease (IPD) comprises the Tri-County (Clackamas, Multnomah, and Washington) Portland metropolitan area with a 2006 estimated population of 1,569,170. More information on the Oregon ABCs program is found at: http://oregon.gov/DHS/ph/acd/abc.shtml.

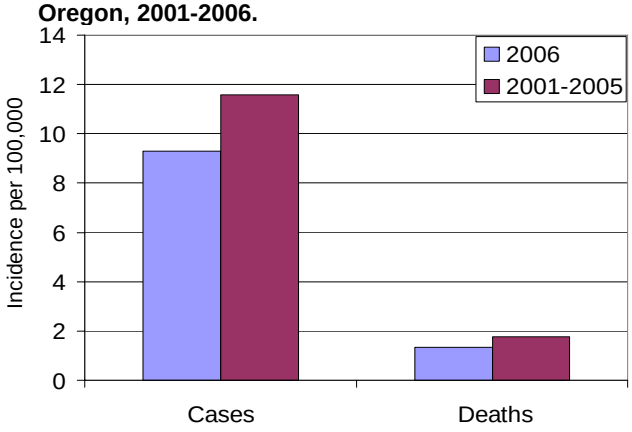
Methods

IPD is defined as the isolation of *S. pneumoniae* from a normally sterile body site in a Tri-County resident. Tri-County hospital laboratories submit *S. pneumoniae* isolates to the Oregon State Public Health Laboratory, which forwards them to a CDC-collaborative laboratory for serotyping and antimicrobial susceptibility testing. Additional cases are identified through regular laboratory record reviews. Health record reviews of each case allow standardized reports of demographic characteristics, clinical syndrome manifestations, underlying conditions, and illness outcome.

Surveillance Results

Descriptive Epidemiology

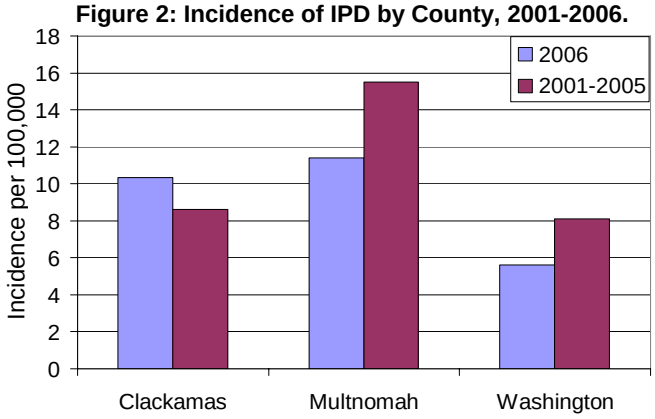
Figure 1: Incidence of IPD Cases and Deaths in Oregon, 2001-2006.



In 2006, 146 cases of IPD were reported in the Tri-County Portland area, corresponding to an incidence rate of 9.3/100,000 persons (Figure 1). This is 20% lower than the average annual incidence rate in the Portland area from 2001–2005 (11.6/100,000) and 33% lower than the 2006 national projection of invasive disease (13.8/100,000).[1] Of these cases, there were 21 deaths, for an annual mortality rate due to IPD of 1.3/100,000 (Figure 1). This is 28% lower than the 2001–2005 Portland area average annual mortality rate (1.8/100,000) and 24% lower than the 2006 national projections (1.7/100,000).[1] The mean and median ages of death due to IPD in 2006 were 75 and 82 years, respectively, which were both increased over 2005, albeit non-significantly. The 2006 case fatality rate for IPD in the Portland area was 14%, slightly lower than that reported in the Portland area from 2001–2005 and slightly higher than the 12% reported from the entire ABCs network in 2006.[1] Over half (53%) of the cases were male; of 44 cases where race was known, 95% were white, 2% were black, and 2% were another race; and

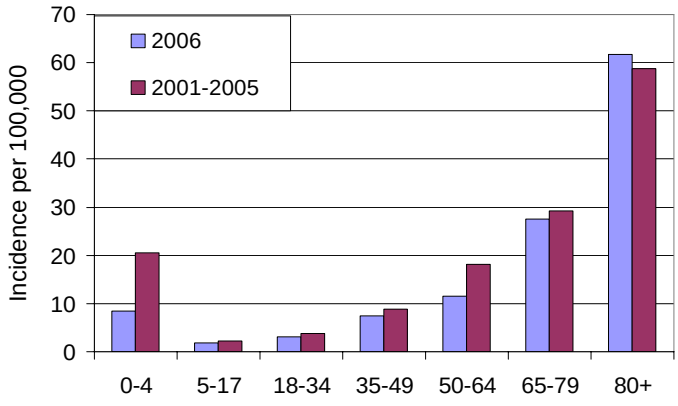
of 38 cases where ethnicity was known, 8% were Hispanic or Latino. These data should be interpreted with caution, however, given that race and ethnicity were not obtained on a majority of the cases.

Figure 2: Incidence of IPD by County, 2001-2006.



As seen in Figure 2, the incidence rate of IPD in Multnomah County in 2006 (11/100,000) was higher than that reported from either Clackamas (10/100,000) or Washington (6/100,000) Counties. This is similar to the historical pattern throughout the Portland area from 2001-2005. However, while the 2006 incidence rate was lower than the previous 5-year average by 26% in Multnomah and 31% in Washington counties, the 2006 incidence rate in Clackamas was 21% higher than the previous 5-year average. In 2006, mortality due to IPD was highest in Clackamas County (1.6/100,000), followed by Multnomah (1.6/100,000) and Washington (0.8/100,000). Compared with the previous 5-year average, IPD mortality in 2006 was 37% lower in Multnomah and 32% lower in Washington counties and 37% higher in Clackamas County.

Figure 3: Incidence of IPD in the Portland Area by Age, 2001-2006.



The burden of disease was highest in those ≥80 years of age (31 cases; incidence of 62/100,000 persons), followed by those 65-79 four years of age (29 cases; 28/100,000) and those 50-64 years of age (33 cases; 11/100,000) (Figure 3). Compared with 2001, the incidence of IPD has declined across all age groups. The most dramatic of these declines occurred in those 0-4 years of age, with a 75% decrease in incidence (2001 incidence 34/100,000). Compared, with 2005, however, we have seen an increase in IPD among the older age groups: that among 65-79 year olds increased 3% and that among those 80 and over increased 38%. Due to this increased occurrence, the incidence in the eldest age group was higher than the previous 5-year average.

In 2006, IPD mortality was also highest in those ≥80 years of age (22/100,000), followed by those 65-79 years of age (3/100,000). There were zero deaths among individuals from 0-34 years of age. Increasing age did exhibit a significant, positive association with fatal outcome from IPD ($p<0.0001$) with case fatality increasing from 0% in the youngest age group to 35% in those 80 and over. Mortality due to IPD was lower in all age groups in 2006 than the previous 5-year average, with the exception of those 80 and over, among whom it was 13% higher. No deaths due to IPD among 0-4 year olds have been reported since 2001.

Clinical Manifestations

The common clinical syndromes reported for IPD cases – bacteremic pneumonia (clinical pneumonia with a positive blood culture), primary bacteremia, and pneumococcal meningitis – are found in Table 1. In 2006, the occurrence of bacteremia was 43% lower than the previous 5-year average; all other clinical syndromes were reported similarly. Since 2001, meningitis has shown a significantly decreasing trend (p=0.04). For all cases reported since 2001, bacteremia, meningitis, and other invasive syndrome were less common with increasing age (p<0.0001 for each) while bacteremic pneumonia was more common (p<0.0001).

Table 1: Percent of IPD Reporting Clinical Syndromes.

Syndrome	2006	2001-2005	p-value
Bacteremic Pneumonia	79	74	0.268
Primary Bacteremia	**8**	**14**	**0.014**
Meningitis	8	8	0.791
Other Syndrome	6	5	0.665

Figure 4a: Incidence of Clinical Syndromes Among Those 0-4 Years of Age, 2001-2006.

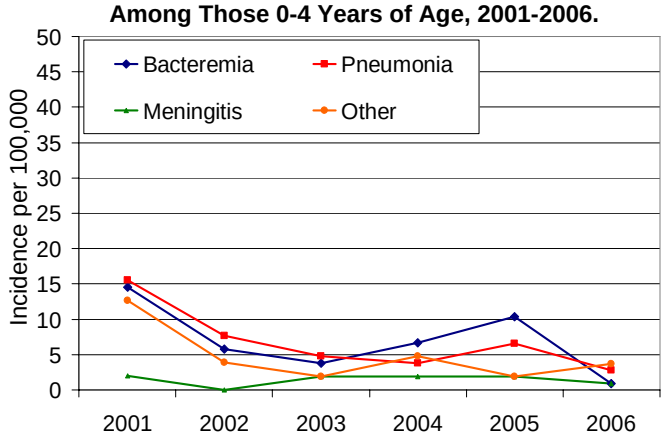
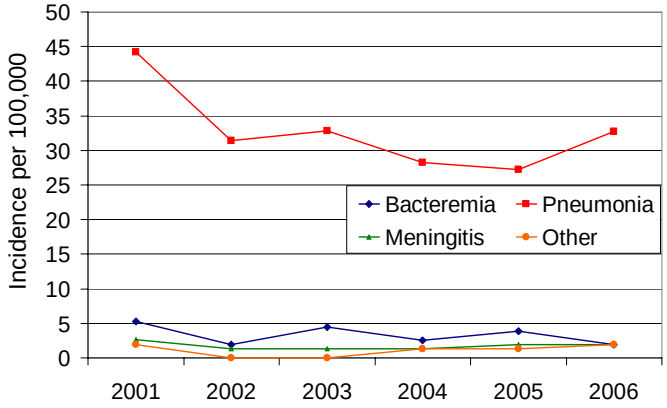


Figure 4b: Incidence of Clinical Syndromes Among Those 65+ Years of Age, 2001-2006.



Among those under 5 years of age, bacteremic pneumonia was the most common single clinical syndrome associated with IPD reported in 2006 (Figure 4a). An increase in bacteremia had been seen from 2003-2005; however, this trend reversed in 2006 with in the incidence of bacteremia decreasing 91% from 10.4 to 0.9 cases per 100,000. The other clinical syndromes have been relatively stable over the six years.

Among those 65 years of age and older, bacteremic pneumonia is – and has been – the major clinical presentation of IPD (Figure 4b).Indeed, the 2006 incidence of pneumonia in this age group was 5.6 times the combined incidence of all other clinical syndromes. While the incidence of the other clinical syndromes has largely remained stable, that of pneumonia increased by 49% from 2005, reversing a five year decreasing trend. This effect was driven by those 80 years and older, among whom pneumococcal pneumonia incidence increased 81% in one year, from 31 to 56 cases per 100,000.

Among cases reported since 2001, clinical syndromes were further analyzed with regard to severity of disease, as measured by fatal outcome. In a multivariate, logistic regression model controlling for age, compared with other invasive syndrome, a fatal outcome was 2.4 times more likely (95% confidence interval [CI] 1.2, 4.9) with meningitis and 2.1 times (95% CI 1.0, 4.4) more likely with bacteremia. No difference in fatal outcome was seen between pneumonia and other invasive syndrome.

Underlying Conditions

Table 2 lists underlying conditions that were reported in greater than 5% of IPD cases in the Portland area during 2001–2006. The presence of any underlying conditions increases with increasing age ($p<0.0001$). Among children less than 18 years of age, asthma was the most common condition (6%), with other underlying conditions reported rarely. Among adults, smoking ($p<0.0001$) decreased with increasing age, while cardiovascular disease ($p<0.0001$), cancer ($p<0.0001$), chronic obstructive pulmonary disease (COPD) ($p<0.0001$), diabetes ($p<0.0001$), and immunosuppression ($p=0.048$) increased with increasing age.

Table 2: Percent of IPD Cases with Reported Underlying Conditions.

	Percent
Cardiovascular Disease	25
Smoking	25
Cancer	18
COPD	16
Diabetes	15
Alcohol Abuse	11
Immunosuppression	12
Asthma	8
None Reported	21

Table 3: Age-Adjusted Significant Associations between Underlying Conditions and Syndrome or Death, 2001-2006

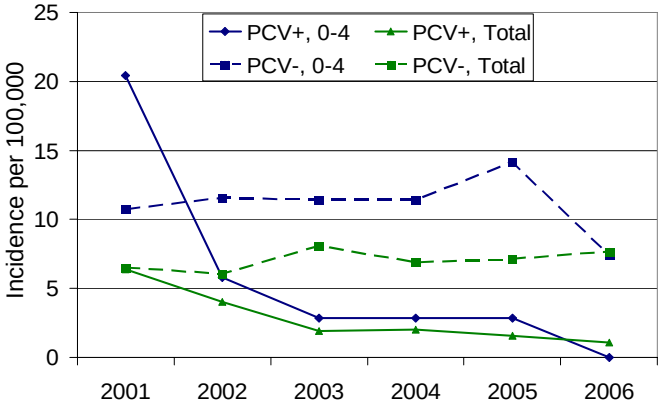
	aOR	95% CI
Pneumonia		
Smoking	2.5	(1.7, 3.6)
COPD	2.7	(1.5, 4.6)
Asthma	2.5	(1.3, 4.6)
Diabetes	2.1	(1.3, 3.5)
Fatal Outcome		
Alcohol Abuse	2.6	(1.6, 4.3)
Cardiovascular Disease	1.6	(1.1, 2.3)
Diabetes	0.5	(0.3, 0.8)
None Reported	0.3	(0.1, 0.7)

Conditions affecting the lung – such as smoking, COPD, and asthma – as well as diabetes were found to be significantly associated with pneumonia (Table 3). No other underlying factors were significant predictors of any clinical syndromes of IPD. As for mortality, those reporting alcohol abuse or cardiovascular disease were more likely to suffer a fatal outcome, while those with diabetes or who have no reported underlying conditions were less likely to suffer a fatal outcome.

Serotype Analysis

Figure 5 depicts the incidence of IPD due to strains of *S. pneumoniae* that are (PCV+) and are not (PCV-) included in the pneumococcal conjugate vaccine (PCV) among those 0-4 years of age and the overall population. From 2001-2006, the incidence of PCV+ strains decreased 100% among those 0-4 years of age and, for the first time, no cases in the 0-4 age group were due to these types. This helped drive an 83% decrease in PCV+ strain incidence overall from 2001 to 2006. At 7.4 per 100,000, the incidence of PCV- strains among 0-4 year olds was also at a low in 2006.

Figure 5: Incidence of PCV+ and PCV- Strains in Those 0-4 and Overall, 2001-2006.



Among those over 64, the incidence of PCV+ strains has stayed relatively stable over the past couple of years, with a slight decrease in incidence in these strains since 2005 (Figure 6). However, the incidence of IPD due to other strains increased over the past year. For the 16 strains included in pneumococcal polysaccharide vaccine (PPV), but not PCV (PPV+/PCV-), the incidence increased 53% from 13 to 20 per 100,000. The incidence of strains not included in PPV (PPV-) increased 99%, from 8 to 17 per 100,000 among this age group. The incidences of both PPV+/PCV- and PPV- strains were higher in 2006 than at any time previously.

Figure 6: Incidence of PPV+ and PPV- Strains in Those 65+, 2001-2006.

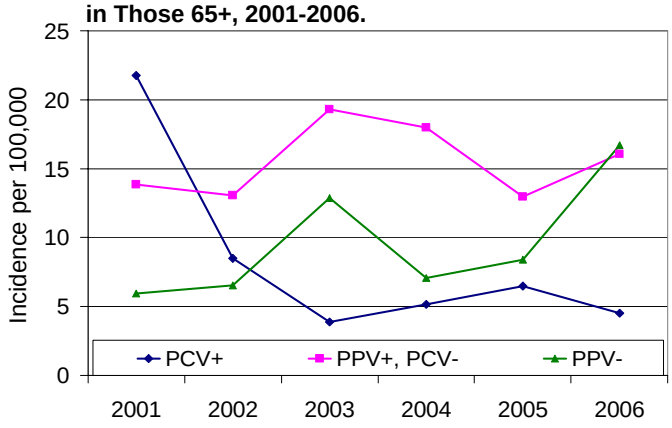
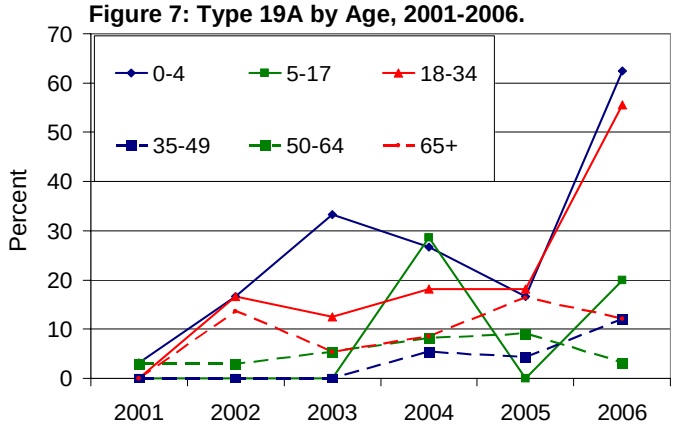


Figure 7: Type 19A by Age, 2001-2006.



Since 2001, one non-vaccine serotype, 19A, has increased in incidence from 0.1 to 1.4 cases per 100,000 in 2006, with a 40% increase in incidence (from 1.0 per 100,000) seen since 2005. In 2006, the highest incidences of 19A were seen in those 80 and older (8.0 per 100,000), followed by those under 5 (4.7 per 100,000).

Serotype 19A also comprises a greater percentage of IPD cases (Figure 7), increasing from 1% of cases in 2001 to 16% of cases in 2006 ($p<0.0001$). A statistically significant increase in the percentage of cases due to 19A was seen among those under 5 ($p=0.0021$), those 18-49 years of age ($p<0.0001$), and those 65 years and older ($p=0.0165$). In 2006, 63% of cases in those under 5, 24% of cases in those 18-49, and 12% of cases in those 65 and older were due to 19A. Type 19A was not associated with clinical syndrome or fatal outcome due to IPD.

Antibiotic susceptibility

The reported susceptibilities of isolates to a variety of antibiotics reflected a continued increasing trend that has been seen in recent years. In 2006, 100% of isolates were fully susceptible to amoxicillin, ceftazidime, chloramphenicol, clindamycin, linozolid, and vancomycin. High susceptibility to rifampin (99%), meropenem (98%), cefuroxime (97%), erythromycin (96%), and penicillin (90%) was also noted. The susceptibilities to erythromycin and penicillin were at the highest point seen in the past six years.

Discussion

The results of IPD Surveillance in Oregon through ABCs are largely consistent with those seen nationally. In particular, decreases in incidence have been seen overall over the past six years, with the largest decrease in disease occurring in those under 5. These decreases have correlated with the March 2000 licensure and subsequent use of PCV. PCV has been found to be efficacious at protecting against IPD and is currently recommended for all children 1-23 months of age as well as children from 24 to 59 months of age who are at high risk for invasive pneumococcal infection.[2] While PCV is most effective within the target population – reflected in zero cases of PCV-covered serotypes among children less than five years of age in Oregon in 2006 – the benefits of decreased incidence of PCV-covered serotypes extend to other ages, as well.[3] With the decrease in these serotypes, the overall rates of IPD in 2006 (8.4 per 100,000 in those less than five and 38.6 per 100,000 in those over 64) remained below the Healthy People 2010 Objectives of 46 per 100,000 and 42 per 100,000, respectively.[1]

The profile of IPD in Oregon is also consistent with previous studies, which have demonstrated that all of the underlying conditions reported frequently among cases are recognized risk factors for invasive disease.[4-6]

Despite the continued decline in the burden of IPD overall, the 2006 surveillance results are not all welcome news. The increase in incidence among those 65 years of age and older seen this year may be the first evidence that serotype replacement disease, in which IPD is caused by serotypes not included in the conjugate vaccine, may slow or reverse gains made against IPD. Indeed, the increase in incidence in the elderly was seen despite a decline in PCV-covered serotypes and seems largely due to an increase in serotype 19A. As serotype 19A has increased as a percentage of cases, especially among those less than five; and as serotype replacement disease has been seen among children, the elderly, and HIV-infected individuals elsewhere,[7-9] it may only be a matter of time before increases in IPD are seen more broadly in Oregon.

References:

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