

Neisseria meningitidis Surveillance Report 2006

Oregon Active Bacterial Core Surveillance (ABCs)

Office of Disease Prevention & Epidemiology

Oregon Department of Human Services

Edited: February 2008



Background:

Active Bacterial Core Surveillance (ABCs) is a core component of the CDC Emerging Infections Program Network. The purpose of the ABCs program 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 for invasive meningococcal disease represents 39.0 million persons in 10 surveillance areas. More information on the EIP/ABCs Network is found at: <http://www.cdc.gov/ncidod/dbmd/abcs>.

In Oregon, the surveillance area for invasive *N. meningitidis* disease comprises the entire state of Oregon with a 2006 estimated population of 3,690,505. More information on the Oregon ABCs program is found at: <http://oregon.gov/DHS/ph/acd/abc.shtml>.

Methodology:

Invasive meningococcal disease (IMD) is defined as the isolation of *N. meningitidis* from a normally sterile body site in resident of Oregon. Since IMD is reportable in Oregon, hospital laboratories submit sterile-site *N. meningitidis* microbiology isolates to the Oregon State Public Health Laboratory for serogrouping. Additional cases are identified through regular laboratory record reviews. Isolates are then sent to a CDC laboratory for further testing, as needed. Health record reviews of each case provide standardized reports of demographic characteristics, clinical syndrome manifestations, underlying illnesses or conditions, and illness outcome.

Surveillance Results:

Burden of Disease

In 2006, 37 cases of IMD were reported in Oregon, corresponding to an incidence rate of 1.0/100,000 persons (Figure 1). This is lower than the average annual incidence rate in Oregon from 2001-2005 (1.5/100,000) and continues the general trend of decreasing incidence seen over recent years. While IMD incidence in OR was higher than the most recent national projection of disease (0.4/100,000), it equaled the Healthy People 2010 goal for IMD (1.0/100,000).¹ There were five

IMD deaths in 2006, for an annual mortality rate of 0.1/100,000 (Figure 1). This is similar to the average annual 2001-2005 rate in Oregon of 0.08/100,000 and similar to the national projections (0.09/100,000).¹ The 2006 case fatality rate for IMD in Oregon was 14%, higher than the 6% reported for Oregon from 2001-2005, but similar to the 14% from the 2006 estimated national projections.¹ Almost half of cases (49%) were male; of 30 cases where race was known, 100% were white; and of 27 cases where ethnicity was known, 8% were Hispanic or Latino.

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

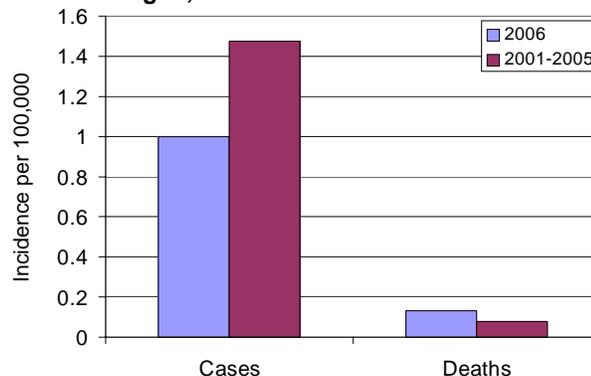
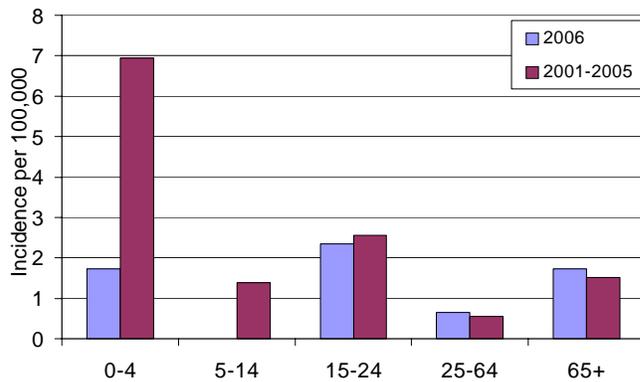


Figure 2: Incidence of IMD in Oregon by Age, 2001-2006.



The burden of IMD is typically highest in the very young (those 0-4 years of age), with a second, lower peak in incidence in young adults, as seen in Oregon from 2001-2005 (Figure 2). In 2006, the incidence of IMD in those 0-4 years of age was much lower than would be expected: 78% lower than the 5-year average, lower than that among 15-24 year olds, and equal to that in those 65 years of age and older. The burden among those 5-14 was also lower than seen recently, as no cases occurred in

this age group. While the burden of IMD was lower among all children, it was similar to or slightly higher than the previous 5-year average among other age groups. With 4 of the 5 deaths in 2006 occurring in those over 65, the mortality rate (0.9/100,000) and case fatality rate (50%) of IMD were highest in this age group and higher than the 5-year, age group-specific averages of 0.2/100,000 and 15%, respectively. This is also different than the typical mortality pattern of IMD, in which children 0-4 experience the highest mortality rate. No deaths were reported in this group in 2006.

Clinical Manifestations

As is typical, the top two clinical manifestations of invasive meningococcal disease in 2006 were meningitis and primary bacteremia, reported among 46% and 38% of cases, respectively (Table 1). The clinical profile of IMD in 2006 was not significantly different than the previous 5-year average. Since 2001, however, a significant,

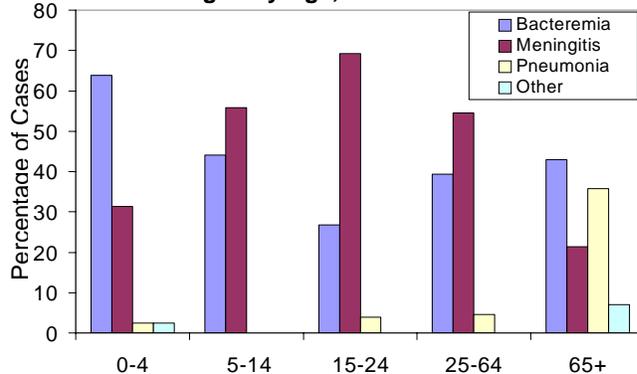
increasing trend in reported meningitis ($p=0.0043$) and concurrent decreasing trend in reported bacteremia ($p<0.0001$) has been seen. From 2001-2006, no clinical manifestation was positively associated with an increased risk of a fatal outcome.

Table 1: Percent of IMD cases reporting common clinical syndromes[†].

Syndrome	2006	2001-2005
Meningitis	46	48
Primary Bacteremia	38	45
Pneumonia	16	7
Other	5	1

[†] Some cases report >1 syndrome.

Figure 3: Clinical Manifestation of IMD in Oregon by Age, 2001-2006.



The clinical presentation of IMD varies according to age. (Figure 3) From 2001-2006, bacteremia was the most common presentation in the youngest and oldest age groups, reaching a low in occurrence among those 15-24. Meningitis was inversely correlated, with a peak of occurrence occurring in those 15-24 years of age. Pneumonia due to *N. meningitidis*, although low overall, increased with increasing age.

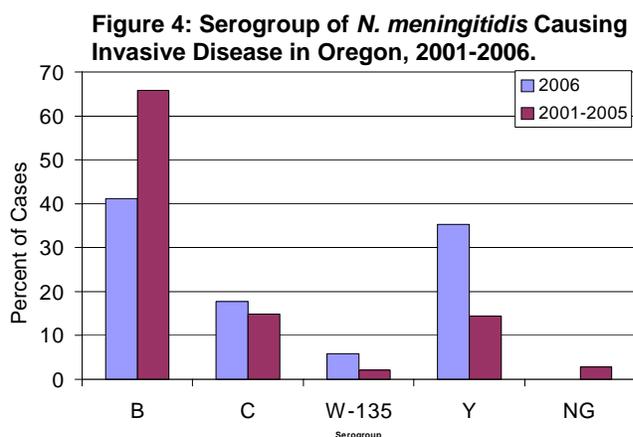
Underlying Conditions

Table 2 lists underlying conditions that are known risk factors for invasive meningococcal disease or were reported frequently among adult IMD cases in Oregon from 2001-2006. A majority (53%) of all cases had no reported underlying conditions, although this is not uniform across the age spectrum: 72% of children less than 18 years of age had no reported underlying conditions versus 36% of adults. Only 19% of those 65 years and older fit this classification. In 2006, the percentage of adult cases reporting smoking (41%) was higher than the previous 5-year average and the percentages reporting cardiovascular disease (9%) and diabetes (6%) were lower, although these differences were not significant. In 2006, 4/5 (80%) of IMD cases in children were reported with no underlying condition; the remaining case had asthma.

Table 2: Adult IMD Cases with Reported Underlying Conditions.

	% of Cases
Smoking	27
Cardiovascular Disease	13
Diabetes	12
COPD	6
Cancer	4
Immunosuppression	4
Asthma	3
None Reported	36

Underlying conditions were further analyzed with regard to fatal outcome and clinical manifestation of IMD. No conditions were associated with either a fatal outcome from IMD or meningitis or bacteremia manifestations. Pneumonia was significantly associated with cardiovascular disease, diabetes, asthma, and chronic obstructive pulmonary disease (COPD). However, after controlling for age, none of these illnesses or conditions remained independently associated with pneumonia.



Serogroup Analysis

In 2006, the serogroup of *N. meningitidis* causing invasive disease was determined for 34 cases (92%). Of these, serogroup B comprised 41%; serogroup Y, 35%; serogroup C, 18%; and serogroup W-135, 6%. (Figure 4) Historically in Oregon, serogroup B has been the predominant serogroup causing IMD. For instance, in 2001, serogroup B comprised 72% of all cases. By 2006, the proportion of serogroup B isolates reported was significantly less than the previous 5-year average ($p=0.008$) and a significant

decreasing trend was noted over the period ($p=0.0008$). Serogroup Y has demonstrated a significant increasing trend since 2001 ($p=0.04$), when it comprised 12% of IMD cases. The percentage of cases due to serogroup Y in 2006 was also significantly higher than the previous 5-year average ($p=0.02$). Although relative increases in serogroups C and W-135 have also been seen in recent years, these are not statistically significant.

The decrease in cases of serogroup B disease among those 11 to 24 years of age seems to be driving the overall trend in meningococcal epidemiology. Serogroup B disease in this age group decreased from 67% of cases in 2000 to 40% in 2005 ($p=0.01$). No significant trends were seen over this time among the other serogroups causing disease in this age group. Since 2000, serogroup C has comprised 19% of cases; serogroup Y, 17%; and non-groupable isolates, 1%. Since 2000, no significant trends in the serogroup profile of IMD were observed among individuals outside of the 11-24 year age group.

None of the serogroups were significantly associated with a fatal outcome among cases of IMD. Serogroup Y was significantly less likely to be identified from those 0-4 years of age ($p=0.017$) – and significantly more likely to be identified from those 65 years of age and older ($p<0.0001$) – than other serogroups. Serogroup B was significantly less likely to be identified from those 25-64 years of age ($p=0.034$) than other serogroups. Among clinical manifestations, serogroup B isolates were more common among those causing bacteremia ($p=0.016$). Serogroup Y was more common among isolates causing pneumonia ($p=0.028$) and less common among isolates causing meningitis ($p=0.012$).

Discussion:

The 2006 surveillance results for IMD, showing historic low occurrence in Oregon, continue to demonstrate an encouraging trend. In the mid-1990's, Oregon was unique among the nation in experiencing an epidemic of serogroup B invasive meningococcal disease. This epidemic was marked by an incidence four times the national rate, a shift to an older age group of individuals affected (15-24 year olds), and the predominance of a single clone of isolates.²

That the rate in Oregon has become closer to the national rate and serogroup B disease has continued to decrease results in an epidemiological profile of IMD that is more similar to the national picture than in previous years. For instance, the decrease in serogroup B disease correlates with a decrease in the percentage of cases reported with bacteremia; meningitis now comprises a majority of IMD cases; a higher incidence of disease was found among 15-24 year olds than among 0-4 year olds; and IMD increasingly manifests as pneumonia due to serogroup Y in those 65 years of age and older. Lack of association between fatal outcome and either bacteremia or serogroup C disease – a previously reported finding – is likely due to the small number of IMD cases reported in Oregon.³

This changing epidemiology in Oregon has major implications for the ability to prevent IMD. The Advisory Committee on Immunization Practices recommends the administration of the meningococcal conjugate vaccine (MCV) routinely for 11-12 year olds; at high-school entry for those who have not previously been vaccinated; or for those at a higher risk of IMD, such as college freshmen living in dormitories.⁴ As MCV is not effective at protecting against serogroup B disease, the importance of MCV vaccination may become more important in Oregon, in light of the continued decreasing trend in serogroup B disease among adolescents and young adults.

References:

1. Centers for Disease Control and Prevention. 2006. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Neisseria meningitidis*, 2005. Available via the Internet: <http://www.cdc.gov/ncidod/dbmd/abcs/survreports/mening06.pdf>.
2. Diermayer M, Hedberg K, Hoesly F, et al. Epidemic Serogroup B Meningococcal Disease in Oregon: The Evolving Epidemiology of the ET-5 Strain. *JAMA*. 1999;281:1493-7.
3. Rosenstein NE, Perkins BA, Stephens D, Lefkowitz L, Cartter ML, Danila R, Cieslak P, Shutt KA, Popovic T, Schuchat A, Harrison LH, Reingold AL, and the Active Bacterial Core Surveillance Team. The changing epidemiology of meningococcal disease in the United States, 1992-1996. *J Infect Dis* 1999;180:1894-1901.
4. Centers for Disease Control and Prevention. Prevention and Control of Meningococcal Disease Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005; 54(No. RR-7):13.