Neisseria meningitidis Surveillance Report 2007

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 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 40.0 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 2007 estimated population of 3,745,455. 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 2007, 30 cases of IMD were reported in Oregon, corresponding to an incidence rate of 0.8/100,000 persons (Figure 1). This is lower than the average annual incidence rate in Oregon from 2002-2006 (1.3/100,000) 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 (0.33/100,000), it was lower than the Healthy People 2010 goal for IMD (1.0/100,000).[1] There were two IMD deaths in 2007, for an annual mortality rate of 0.05/100,000 (Figure 1). This is lower than the average annual rate in Oregon of 0.08/100,000 from 2002-2006, but similar to the national projections (0.04/100,000).[1] The 2007 case fatality rate for IMD in Oregon was 7%, similar to the 6% reported for Oregon from 2002-2006 and lower than national projections (13%).[1] Forty percent of cases were male; of 20 cases where race was known, 100% were white; and of 17 cases where ethnicity was known, 24% were Hispanic or Latino.

Figure 1: Incidence of IMD Cases and Deaths in Oregon, 2002-2007.

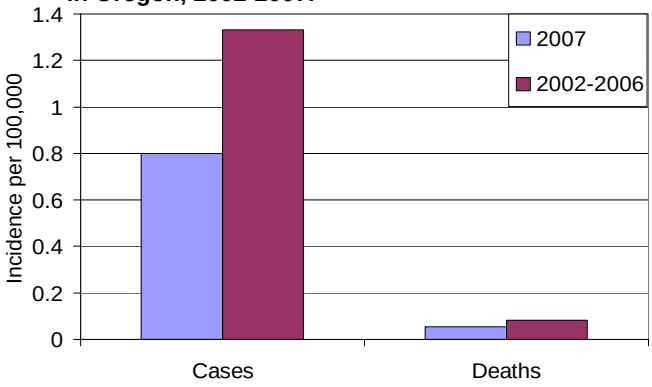
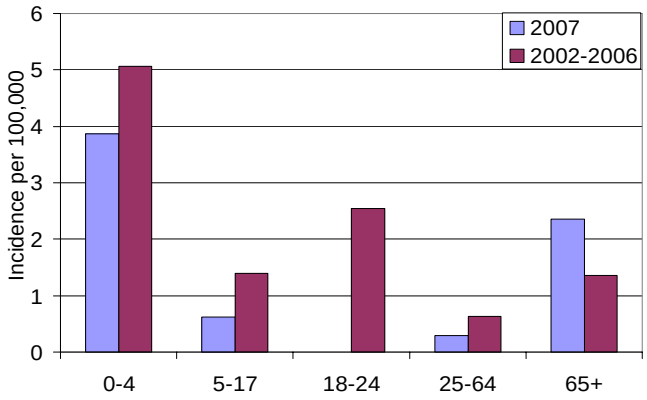


Figure 2: Incidence of IMD in Oregon by Age, 2002-2007.



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 2002-2006 (Figure 2). In 2007, the incidence of IMD was lower than the previous 5-year average among those less than 65 years and no cases were reported in those 18-24 years of age. Among those those 65 and older, 2007 IMD incidence (2.4/100,000) and mortality (0.43/100,000) were 73% and 22% higher than the respective 5-year averages (1.4/100,000 and 0.35/100,000). Both deaths in 2007 occurred in this age group.

Clinical Manifestations

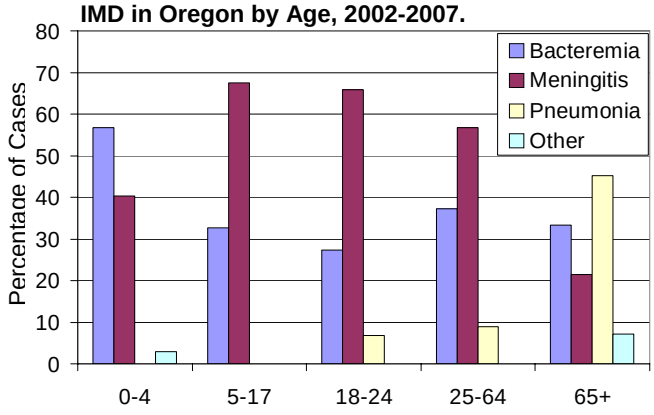
As is typical, the top two clinical manifestations of invasive meningococcal disease in 2007 were meningitis and primary bacteremia, reported among 40% and 43% of cases, respectively (Table 1). The clinical profile of IMD in 2007 was not significantly different compared to the previous 5-year average. Since 2002, however, a significant, increasing trend in reported pneumonia (p=0.0086) has been seen. From 2002-2007, 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	2007	2002-2006
Meningitis	40	52
Primary Bacteremia	43	38
Pneumonia	23	9
Other	0	2

[†] Some cases report >1 syndrome.

Figure 3: Clinical Manifestation of IMD in Oregon by Age, 2002-2007.



The clinical presentation of IMD varies according to age. (Figure 3) From 2002-2007, bacteremia was most common among those less than five, meningitis was most common among those 5-64, and pneumonia was most common among those 65 and over. The association between age and manifestation is statistically significant, with bacteremia and meningitis decreasing with increasing age, p=0.031 and p=0.023, respectively, and pneumonia increasing, p<0.0001.

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 2002-2007. Half (50%) of all cases had no underlying conditions noted in the medical record, although this is not uniform across the age spectrum: 72% of children less than 18 years of age had no reported underlying conditions versus 33% of adults (p<0.0001). Only 19% of those 65 years and older fit this classification. In 2007, the percentages of adult cases reporting cardiovascular disease (29%), diabetes (18%), asthma (12%), and immunosuppression (12%) were higher – and those reporting smoking (24%) and no reported risk factor (18%) were lower – than the previous 5-

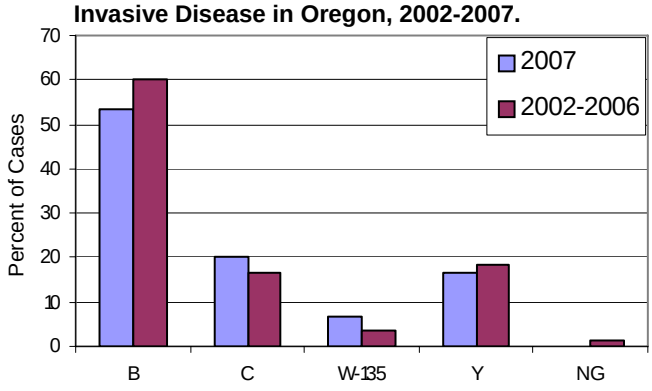
year average, although these differences were not statistically significant. In 2007, 10/13 (77%) of IMD cases in children were reported with no underlying condition, similar to previous years.

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. While pneumonia was significantly associated with cardiovascular disease and asthma, overall, only asthma remained independently associated with pneumonia after controlling for age (p=0.0077).

Table 2: Adult IMD Cases with Reported Underlying Conditions, 2002-2007.

	% of Cases
Smoking	27
Cardiovascular Disease	14
Diabetes	12
COPD	5
Cancer	5
Immunosuppression	5
Asthma	4
None Reported	**33**

Figure 4: Serogroup of *N. meningitidis* Causing Invasive Disease in Oregon, 2002-2007.



Serogroup Analysis

In 2007, the serogroup of *N. meningitidis* causing invasive disease was determined for 29 cases (97%). Of these, serogroup B comprised 53%; serogroup Y, 18%; serogroup C, 20%; and serogroup W-135, 7%. (Figure 4) Historically in Oregon, serogroup B has been the predominant serogroup causing IMD. While the serogroup profile of cases reported in 2007 was not significantly different than that for cases reported during the previous five years, a statistically significant decreasing trend in the proportion of cases due to serogroup B has been noted (p=0.0079).

None of the serogroups were significantly associated with a fatal outcome among cases of IMD. Serogroup B was significantly more likely to be identified from those 0-4 years of age (p=0.011) and significantly less likely to be identified from those 65 years of age and older (p=0.0009) than other serogroups. Among clinical manifestations, serogroup B isolates were more common among those causing bacteremia (p=0.026) and less likely among those causing meningitis (p=0.0007).

Discussion:

The rate of IMD in Oregon in 2007, as with that nationwide, was at a historic low. At 0.8 cases per 100,000 in this state, the rate has declined 75% from the 3.2 cases per 100,000 seen in 1996. This peak was driven by a localized epidemic of serogroup B meningococcal disease that occurred in 1996 and which has lasted into this decade.[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. 2008. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Neisseria meningitidis*, 2007-provisional. Available via the Internet: http://www.cdc.gov/ncidod/dbmd/abcs/survreports/mening07.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.