Neisseria meningitidis Surveillance Report 2009

Oregon Active Bacterial Core Surveillance (ABCs)

Office of Disease Prevention & Epidemiology
Oregon Health Authority

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Background

The Active Bacterial Core surveillance (ABCs) program is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). 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), *Streptococcus pneumoniae*, and methicillin-resistant *Staphylococcus aureus* (MRSA). The entire EIP Network for invasive *N. meningitidis* disease represents 37 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/abcs/index.html.

In Oregon, the surveillance area for invasive *N. meningitidis* disease comprises the entire state, with a 2009 estimated population of 3,823,465.* More information on the Oregon ABCs program is found at: http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/Pages/abc.aspx.

Methods

Invasive meningococcal disease (IMD) is defined as the isolation of *N. meningitidis* from a normally sterile body site in a 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. Isolates are forwarded to a CDC laboratory for further testing, as needed. Additional cases are identified through regular laboratory record reviews. Health record reviews of each case provide standardized reports of demographic characteristics, clinical syndrome manifestations, underlying illnesses or conditions, and illness outcome.

Surveillance Results

Descriptive Epidemiology

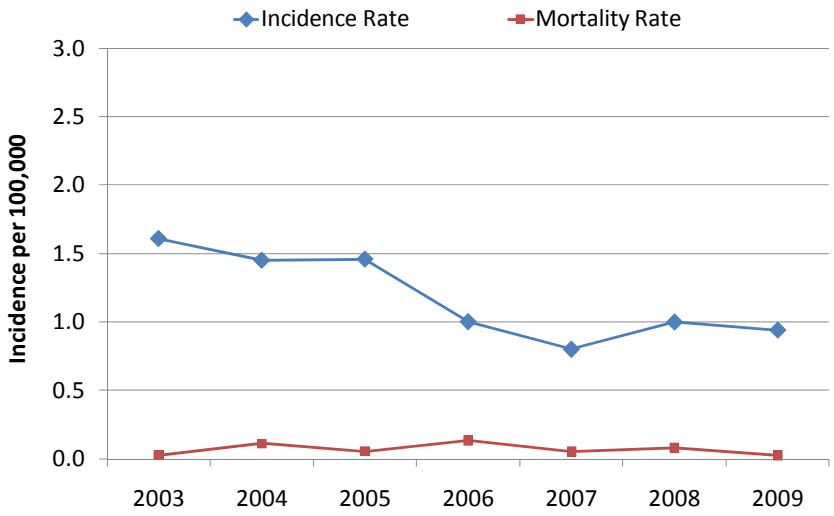
In 2009, 36 cases of IMD were reported in Oregon, corresponding to an incidence rate of 0.94 per 100,000 persons. This is lower than the average annual incidence rate in Oregon from 2004-2008 (1.1/100,000) and continues the overall trend of decreasing incidence seen over recent years (Figure 1). However, IMD incidence in Oregon was still higher than the most recent national estimate (0.28/100,000) but comparable to the Healthy People 2010 goal for IMD (1.0/100,000).[1] Oregon's historically high rate of meningococcal disease was driven by a localized epidemic of serogroup B IMD that began in the early nineties and peaked in 1994 (3.4/100,000).[2] The incidence of serogroup B IMD

* Source: Portland State University Population Research Center (http://www.pdx.edu/prc/)

has since then declined steadily, but B remains the most commonly identified serogroup in Oregon, accounting for about half of our cases in recent years. The estimate for serogroup B disease is 0.09 per 100,000 cases for all ABCs areas excluding Oregon, 79 percent lower than the Oregon-specific rate for serogroup B IMD (0.42 per 100,000).[1]

There was one IMD death in 2009, for an annual mortality rate of 0.03/100,000 (Figure 1). This is lower than the average annual mortality rate in Oregon of 0.1/100,000 from 2004-2008, and similar to the national projections (0.04/100,000).[1]

Figure 1: Incidence and Mortality Rates of IMD Cases in Oregon

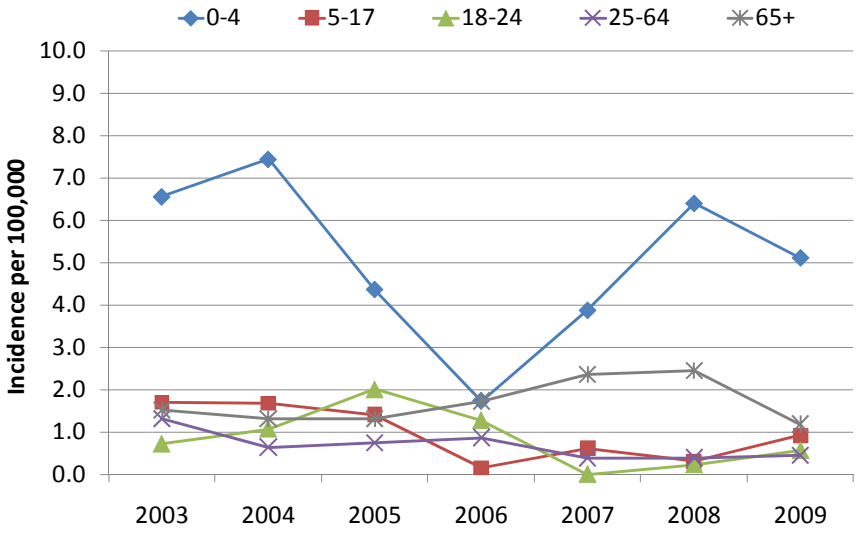


The 2009 case fatality rate for IMD in Oregon was 3 percent, lower than both the 8 percent reported for Oregon from 2004-2008 and the national projections (13%).[1] The one death in 2009 occurred in the 0-4 age group.

Fifty percent of cases were male; of 32 cases for which race was known, 94 percent were white, 6 percent were black (n=2); and of 32 cases where ethnicity was known, 6 percent were Hispanic or Latino.

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. However, during the last few years, the incidence of IMD was highest among the 0-4 year olds followed by those over the age of 65.

Figure 2: Incidence of IMD Cases in Oregon by Age



Among those 65 and older, 2009 IMD incidence (1.2/100,000) and mortality (0.0/100,000) were both lower than the respective 5-year averages (1.8/100,000 and 0.43/100,000), although this decrease was not statistically significant. For cases reported since 2004, fatal outcome from IMD is significantly associated with age ($p<0.0001$).

Clinical Manifestations

As is typical, the top two clinical manifestations of invasive meningococcal disease in 2009 were meningitis and primary bacteremia; together, they accounted for 78 percent of cases (Table 1). The clinical profile of IMD in 2009 was not significantly different compared to the previous 5-year average. From 2004-2009, no particular clinical manifestation was associated with an increased risk of a fatal outcome.

Table 1: Percent of IMD Cases† Reporting Common Clinical Syndromes

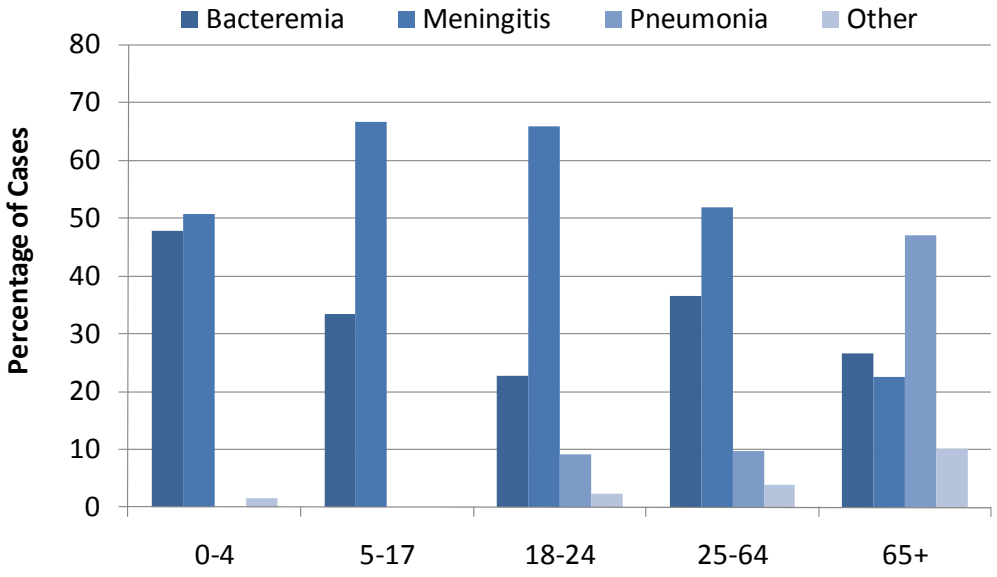
Syndrome	2009	2004-2008
Meningitis	39	52
Primary bacteremia	39	34
Pneumonia	14	13
Other††	8	3

† Some cases report more than 1 syndrome.

†† Other syndrome includes cellulitis, endometritis, epiglottitis, peritonitis, septic abortion, septic arthritis, and sterile abscess.

The clinical presentation of IMD varies according to age (Figure 3). From 2004-2009, meningitis was most common among all age groups under 65 years of age and pneumonia was most common among those 65 and over. The association between age and clinical manifestation is statistically significant, with bacteremia and meningitis decreasing with increasing age, p=0.0495 and p=0.0003, respectively, and pneumonia increasing, p<0.0001.

Figure 3: Clinical Manifestation of IMD in Oregon by Age 2004-2009



Underlying Conditions

Table 2 lists underlying conditions that are known risk factors for invasive meningococcal disease or were noted frequently among adult IMD cases in Oregon from 2004-2009. Over half (52%) of all cases had no underlying conditions noted in the medical record, although this is not uniform across the age spectrum: 75 percent of children less than 18 years of age had no underlying conditions versus 36 percent of adults ($p<0.0001$). Only 30 percent of those 65 years and older did not have underlying conditions.

Table 2: Underlying Conditions Reported Among Adult IMD Cases

Underlying Condition	2009 only (n=18) N (%)	2004-2009 (n=145) N (%)
Smoking	4 (22)	34 (23)
Cardiovascular disease	2 (11)	17 (12)
Diabetes	1 (6)	13 (9)
COPD	1 (6)	10 (7)
Immunosuppression	1 (6)	7 (5)
Asthma	1 (6)	7 (5)
Cancer	0 (0)	4 (3)
None	8 (44)	52 (36)

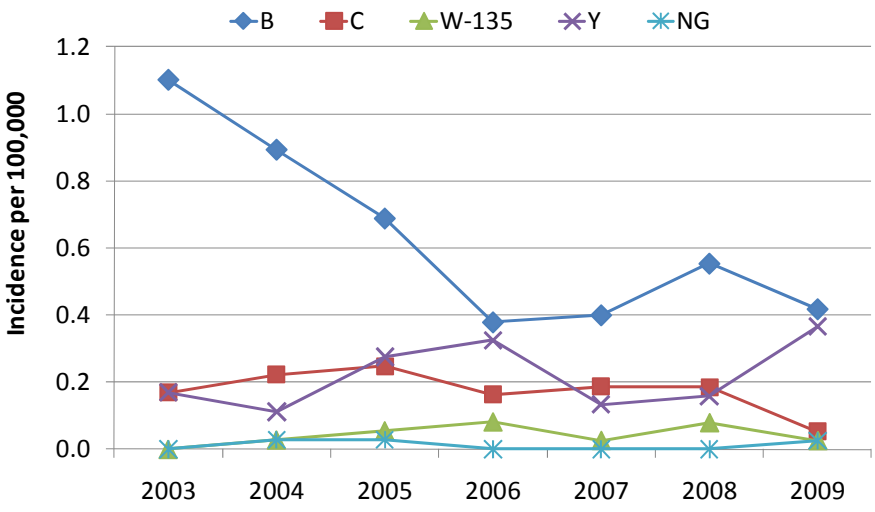
Underlying conditions were further analyzed with regard to fatal outcome and clinical manifestation of IMD. No conditions were associated with either a fatal outcome from IMD or bacteremia manifestations. However, meningitis was significantly associated with COPD and immunosuppression, even after controlling for age ($p=0.0030$ and $p=0.0006$, respectively). After controlling for age, pneumonia was significantly associated with all underlying conditions listed above.

Serogroup Analysis

In 2009, the serogroups of *N. meningitidis* causing invasive disease were determined for 97% of all cases (n=35). Of these, serogroup B comprised 46 percent; serogroup C, 6 percent; serogroup W-135, 3 percent; and serogroup Y, 40 percent. Historically in Oregon, serogroup B has been the predominant serogroup causing IMD.

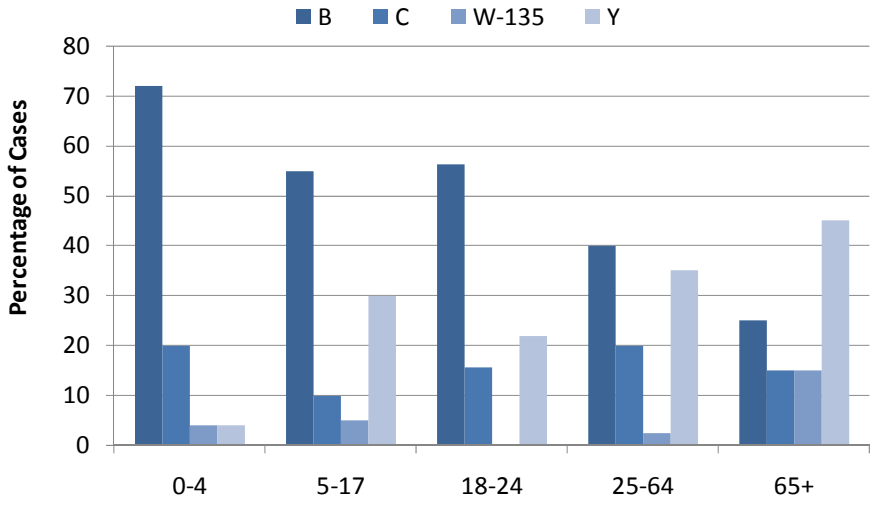
While the serogroup profile of cases reported in 2009 was not significantly different than that for cases reported during the previous five years, a statistically significant decreasing trend in the proportion of cases due to serogroup B (p=0.0003) and an increasing trend in the proportion of cases due to serogroups W-135 and Y (p<0.0001 and p<0.0001, respectively) have been noted. Changes in serogroup distribution since 2003 can be observed in Figure 4.

Figure 4: Serogroup of *N. meningitidis* Causing Invasive Disease in Oregon, 2003-2009



During the five-year period from 2005-2009, serogroup B was the most commonly identified serogroup among those 0-4 years of age (72%), and serogroups W-135 and Y were the least common (4%) (Figure 5). Among those 65 years of age and older, serogroup Y was the most commonly identified group (45%).

Figure 5: Serogroup of N. meningitidis Causing Invasive Disease in Oregon by Age Group, 2005-2009.



The only serogroup significantly associated with a fatal outcome among cases of IMD was serogroup W-135 (p=0.0031). Among clinical manifestations, serogroup B was negatively associated with pneumonia (p=0.0003) and serogroup Y was negatively associated with meningitis (p=0.0398).

Discussion

Oregon's highest recorded rate of meningococcal disease – 3.4 cases per 100,000 in 1994 – was driven by a clonal epidemic of serogroup B disease that began in 1993 and lasted for several years. In 2009, 36 cases of IMD were reported in the state, corresponding to an incidence rate of 0.94 cases per 100,000. This reflects a 72 percent decrease in incidence since the peak in 1994. As serogroup B disease continues to decrease, the profile of IMD serogroup distribution is becoming more similar to the national profile.

Furthermore, although the burden of IMD is typically highest in the very young followed by young adults, during the last few years the incidence of IMD was highest among the 0-4 year olds followed by those over the age of 65. In the coming year, we will be participating in an extensive retrospective chart review of IMD cases among those 65 years of age or older to better understand the burden of disease within this age group.

The changing epidemiology of *Neisseria meningitidis* in Oregon has major implications for the prevention of IMD. The Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination with the quadrivalent (antigens from serogroups A, C, Y, and W-135) meningococcal conjugate vaccine (MCV4) for all persons 11–18 years of age and for persons 2–55 years of age who are at increased risk for the disease.[3] Although MCV4 is not effective at protecting against serogroup B disease, the importance of MCV4 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. 2010. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Neisseria meningitidis*, 2009. Available via the Internet: www.cdc.gov/abcs/reports-findings/survreports/mening09.pdf. Accessed 09 Jun 2011.
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. Centers for Disease Control and Prevention. Licensure of a Meningococcal Conjugate Vaccine and Guidance for Use - Advisory Committee on Immunization Practices (ACIP). MMWR 2010; 59(09);273. Available via the Internet: www.cdc.gov/mmwr/preview/mmwrhtml/mm5909a5.htm. Accessed 09 Jun 2011.