

# Neisseria meningitidis Surveillance Report 2005

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 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 2005 estimated population of 3,631,440. More information on the Oregon ABCs program is found at: <http://oregon.gov/DHS/ph/acd/abc.shtml>.

## Methodology:

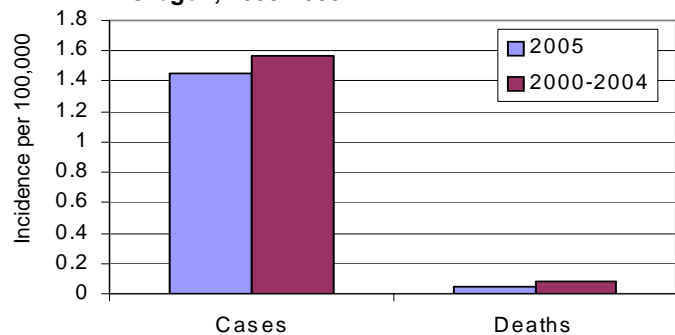
Invasive meningococcal disease (IMD) is defined as the isolation of *N. meningitidis* from a normally sterile body site in resident of Oregon. Since IMD is reportable in Oregon, hospital laboratories submit sterile-site *N. meningitidis* microbiology isolates to the Oregon State Public Health Laboratory 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:

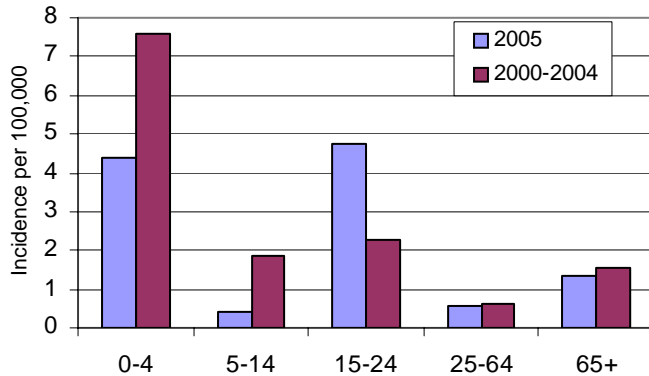
### Burden of Disease

In 2005, 53 cases of IMD were reported in Oregon, corresponding to an incidence rate of 1.5/100,000 persons (Figure 1). This is slightly lower than the average annual incidence rate in Oregon from 2000-2004 (1.6/100,000), yet higher than both the 2005 national projections of disease (0.4/100,000) and the Healthy People 2010 goal for IMD (1.0/100,000).<sup>1</sup> There were two IMD deaths in 2005, for an annual mortality rate of 0.1/100,000 (Figure 1). This is similar to the average annual 2000-2004 rate in Oregon of 0.1/100,000 and slightly higher than the 2005 national projections (0.02/100,000).<sup>1</sup> The 2005 case fatality rate for IMD in Oregon was 4%, lower than the 6% and 7% reported for Oregon from 2000-2004 and estimated national projections, respectively.<sup>1</sup> Of 52 cases where sex was known, 52% were male; of 42 cases where race was known, 83% were white, 12% were black, and 5% were other race; and of 43 cases where ethnicity was known, 14% were Hispanic or Latino.

Figure 1: Incidence of IMD Cases and Deaths in Oregon, 2000-2005.



**Figure 2: Incidence of IMD in Oregon by Age, 2000-2005.**



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 2000-2004 (Figure 2). In 2005, the incidence of IMD was considerably lower in those from 0-14 years of age, as compared to the 5-year annual average, and considerably higher in those from 15-24 years. Further, for the first time, the incidence in the latter group (4.8/100,000) was higher than in those less than four years of age

(4.4/100,000). The mortality rate due to IMD was highest in the youngest age group in 2005 at 0.4/100,000, followed by those 65 years of age and older (0.2/100,000). This pattern is consistent with the previous 5-year average. The mortality and case fatality rate due to IMD was lowest in those 5-14 years of age, for which no deaths were reported from 2000-2005. However, from 2000-2005, case fatality was highest in those 65 years and older (15%), followed by those 25-64 (6%), 15-24 (5%) and 0-4 (4%).

### Clinical Manifestations

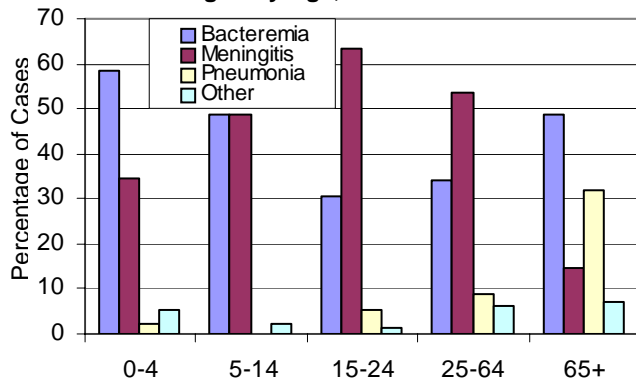
The top two clinical manifestations of invasive meningococcal disease reported in 2005, as seen in Table 1, were meningitis and primary bacteremia, which were reported among 62% and 19% of cases, respectively. Meningitis was reported significantly more ( $p=0.005$ ), and bacteremia significantly less ( $p<0.0001$ ), than the previous 5-year average. Further, there has been a significant, increasing trend in reported meningitis and concurrent decreasing trend in bacteremia since 2000 ( $p<0.0001$  for both). Meningitis surpassed bacteremia as the most commonly reported clinical manifestation of IMD in 2003. From 2000-2005, no clinical manifestation was positively associated with an increased risk of a fatal outcome.

**Table 1: Percent of IMD cases reporting common clinical syndromes<sup>†</sup>.**

| Syndrome           | 2005 | 2000-2004 |
|--------------------|------|-----------|
| Meningitis         | 62   | 42        |
| Primary Bacteremia | 19   | 49        |
| Pneumonia          | 8    | 8         |
| Other              | 11   | 3         |

<sup>†</sup> Some cases report >1 syndrome.

**Figure 3: Clinical Manifestation of IMD in Oregon by Age, 2000-2005.**



The clinical presentation of IMD also varies according to age. (Figure 3) 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. In 2005, meningitis was the predominant clinical manifestation of IMD among all age groups, peaking at 100% of all cases among those 5-14 years of age. This

pattern of occurrence was similar to historical trends, as was a higher occurrence of pneumonia among the oldest age group. The main difference was a low occurrence of bacteremia across all age groups.

## Underlying Conditions

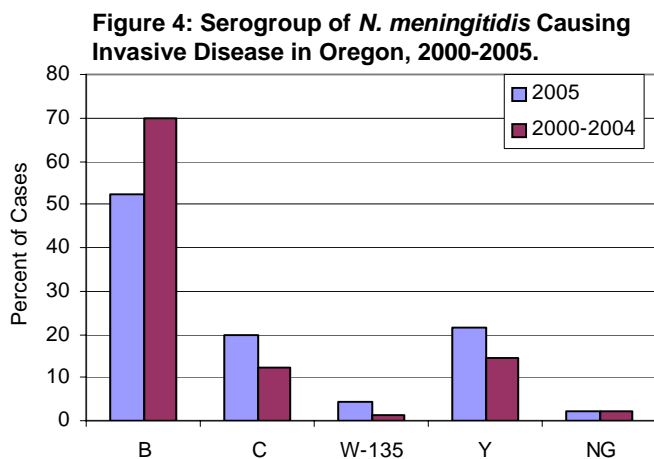
Table 2 lists underlying conditions that are known risk factors for invasive meningococcal disease or were reported frequently among cases in Oregon from 2000-2005. Although an overall majority of cases have no underlying conditions reported, this profile varies across the age spectrum. While 77% of those 0-4 and 74% of those 15-24 have no underlying illness or condition reported, 16% of those 65 years and older fit this classification.

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.

**Table 2: Adult IMD Cases with Reported Underlying Conditions.**

|                        | % of Cases |
|------------------------|------------|
| Smoking                | 11         |
| Cardiovascular Disease | 8          |
| Diabetes               | 6          |
| Asthma                 | 4          |
| Cancer                 | 3          |
| COPD                   | 3          |
| Immunosuppression      | 2          |
| <b>None Reported</b>   | <b>60</b>  |

## Serogroup Analysis



In 2005, the serogroup of *N. meningitidis* causing invasive disease was determined for 46 cases (87%). Of these, serogroup B comprised 52%; serogroup Y, 22%; serogroup C, 20%; serogroup W-135, 4%; and non-groupable isolates, 2%. (Figure 4) Historically in Oregon, serogroup B has been the predominant serogroup causing IMD. For instance, in 2000, serogroup B comprised 73% of all cases. By 2005, the proportion of serogroup B isolates reported was significantly less than the previous 5-year average ( $p=0.003$ ) and a significant decreasing trend was noted over the period

( $p=0.006$ ). A relative increase in serogroups C, Y, and W-135 isolates was seen, although the increase in each serogroup was not 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:

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.<sup>2</sup> The above surveillance results indicate that this epidemic may be ending, as the overall incidence of IMD in Oregon is much closer to the national rate, and serogroup B disease among 15-24 year olds has declined significantly over the past five years.

The epidemiological profile of IMD in Oregon 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. That meningitis now comprises a majority of IMD cases reported mirrors national statistics. A difference between the epidemiology of IMD in Oregon in 2005 and that nationally (as well as with historical patterns) is the higher incidence of disease among 15-24 year olds than among 0-4 year olds. Whether this finding reflects artifact due to small sample size, an overall trend of decreasing serogroup B disease, or some other explanation will need to be monitored through future surveillance efforts. 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.<sup>3</sup>

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.<sup>4</sup> However, MCV is not effective at protecting against serogroup B disease. The significant decreasing trend in serogroup B disease among adolescents and young adults increases the importance of following these recommendations to protect against the occurrence of IMD due to other serogroups. Health care providers in Oregon may need a renewed focus on the need to provide MCV in light of these changing data.

## 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/mening05.pdf>.
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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.