

***Haemophilus influenzae* 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 *H. influenzae* 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 *H. influenzae* 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 *H. influenzae* disease (IHiD) is defined as the isolation of *H. influenzae* from a normally sterile body site in a resident of Oregon. Since IHiD is reportable in Oregon, hospital laboratories submit sterile site *H. influenzae* microbiology isolates to the Oregon State Public Health Laboratory for serotyping. Additional cases are identified through regular laboratory record reviews. Isolates are forwarded to a CDC laboratory for confirmation of serotype. 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, 52 cases of IHiD were reported in Oregon, corresponding to an incidence rate of 1.36/100,000 persons (Figure 1). This is slightly lower than the average annual incidence rate in Oregon during the previous five years (1.50/100,000) and 13 percent lower than the most recent national estimates of disease (1.62/100,000).¹

There were 8 IHiD deaths in 2009, for an annual mortality rate of 0.21/100,000, 17 percent higher than the previous five-year average in Oregon (0.18/100,000) and 5 percent lower than the national mortality rate projection for IHiD (0.22/100,000).¹

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



The 2009 case fatality rate for IHiD in Oregon was 15%, which is slightly higher than both the 12 percent reported for Oregon from 2004-2008 and 14 percent based on national projections.¹

Of 52 cases where sex was known, 58 percent were male; of 31 cases where race was known, 90 percent were white; and of 30 cases where ethnicity was known, 16 percent were Hispanic or Latino.

Consistent with historical patterns, the burden of IHiD in 2009 was highest (5.93/100,000) among those 65 years of age and older, followed by those 0-4 (2.98/100,000) (Figure 2). From 2003 to 2009, IHiD incidences among those under five and those 65 years and older increased by 36 percent and 25 percent, respectively. Other age groups have remained largely stable over the last few years.

Mortality due to IHiD in 2009 was highest among those 65 years of age and older (1.19/100,000), almost five times higher than the age-specific mortality rate in 2008 (0.20/100,000) and 38 percent higher than the age-specific previous 5-year average (0.86/100,000).

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

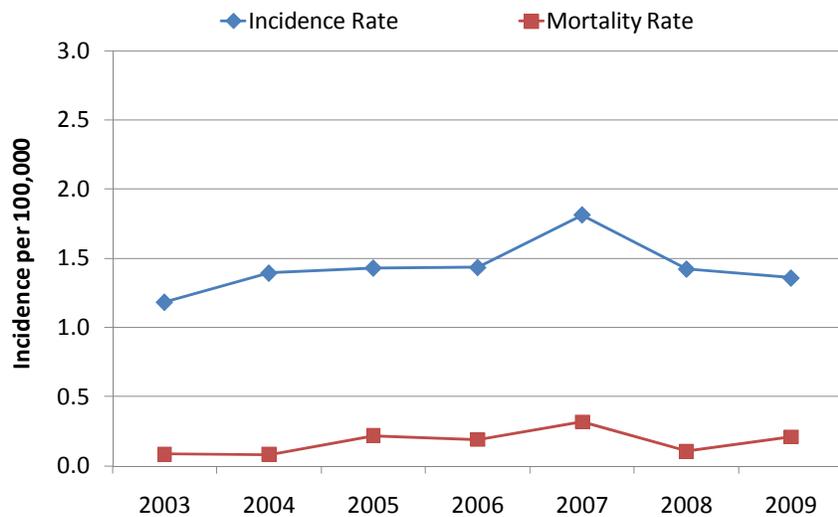
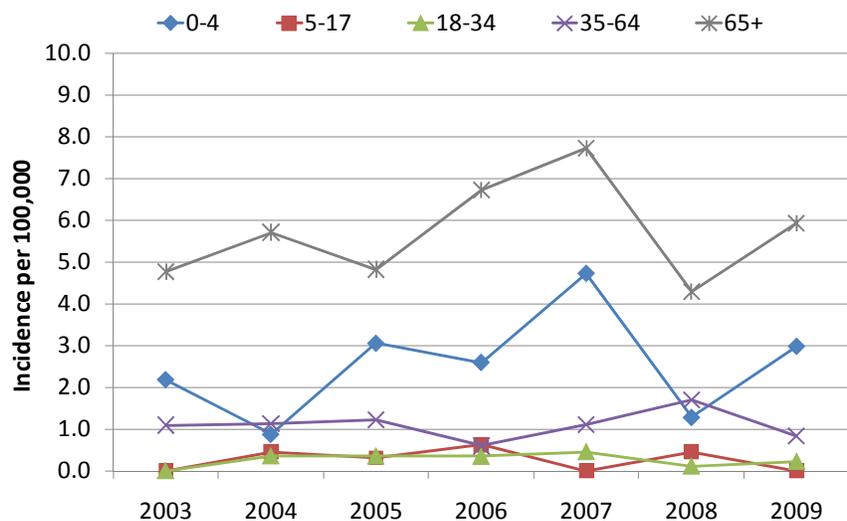


Figure 2: Incidence of IHiD Cases in Oregon by Age



Clinical Manifestations

The top two clinical manifestations of IHiD reported in 2009 – bacteremic pneumonia (clinical pneumonia with a positive blood culture) and primary bacteremia – were reported among 65 percent and 21 percent of cases, respectively (Table 1). Although the clinical syndrome profile of IHiD has been roughly stable over the six year period, meningitis in 2009 was significantly less common compared to the previous 5-year average ($p=0.0276$). From 2004-2009, clinical manifestation of IHiD was not significantly associated with fatal outcome.

Table 1: Percent of IHiD Cases[†] Reporting Common Clinical Syndromes

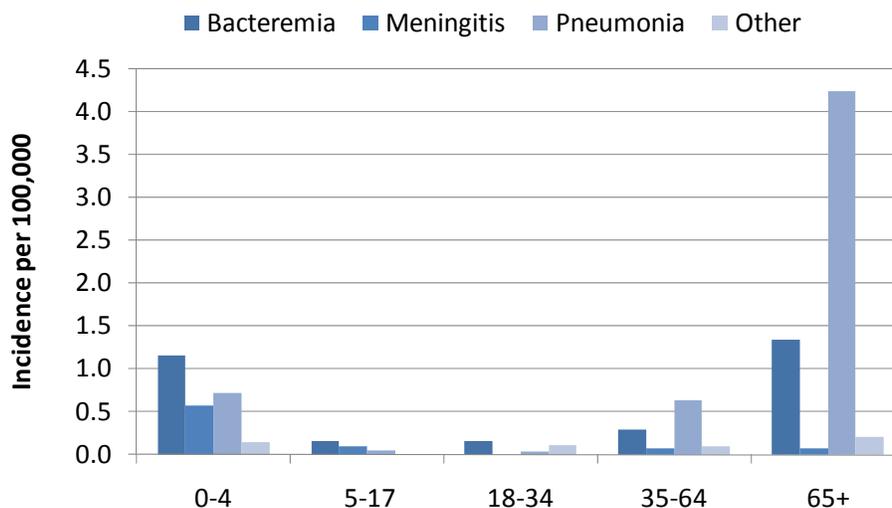
Syndrome	2009	2004-2008
Bacteremic pneumonia	65	56
Primary bacteremia	21	30
Meningitis	2	7
Other ^{††}	12	6

[†] Some cases report more than 1 syndrome.

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

From 2004-2009, bacteremia was the most common presentation among all persons less than 35 years of age (Figure 3). Meningitis was most common among those under 5 years of age, while bacteremic pneumonia was most common among the elderly population over 65 years of age.

**Figure 3: Clinical Manifestation of IHiD in Oregon by Age
2004-2009 six-year average**



Bacteremia and meningitis decreased with increasing age ($p=0.0004$ and $p<0.0001$, respectively), while bacteremic pneumonia increased with age ($p<0.0001$).

Underlying Conditions

The most commonly identified underlying conditions among IHiD cases are chronic obstructive pulmonary disease (COPD) (31%), cardiovascular disease (23%), and diabetes (21%). This profile is relatively similar to the underlying condition profile seen for all cases reported since 2004 (Table 2).

Table 2: Underlying Conditions Reported Among IHiD Cases

Underlying Condition	2009 only (n=52)	2004-2009 (n=334)
	N (%)	N (%)
Cardiovascular disease	12 (23)	102 (31)
COPD	16 (31)	77 (23)
Diabetes	11 (21)	63 (19)
Cancer	6 (12)	55 (16)
Smoking	9 (17)	51 (15)
Asthma	5 (10)	38 (11)
Immunosuppression	6 (12)	32 (10)
Alcohol abuse	4 (8)	20 (6)
None	7 (13)	43 (13)

The frequencies of cancer, cardiovascular disease, COPD, and diabetes increase with age among IHiD, while the remaining underlying conditions are reported most frequently among IHiD cases 35-64 years of age.

No underlying risk factors were reported from 13 percent of cases, although this varied considerably by age. Forty-one percent of cases less than five years of age had no underlying conditions, in contrast to only 5 percent of cases 65 and over.

Cardiovascular disease was the only condition associated with a fatal outcome from IHiD ($p=0.0043$). While bivariate analyses revealed several significant associations between underlying conditions and clinical syndrome manifestation, no conditions were significant predictors of any clinical manifestation after controlling for age.

Serotype Analysis

In 2009, serotyping was completed for all 52 (100%) *H. influenzae* isolates causing invasive disease. Of these, there was one nonfatal case of type b. This case presented as pneumonia in a 57-year old male smoker, hospitalized for four days. Of the remaining IHiD isolates, 37 (71%) were nontypeable and 14 (27%) were of a type other than serotype b (Figure 4). This was not significantly different from the serotype profile of cases reported during the previous five years. Also, this serotype distribution did not vary by age (Figure 5). Among each age group, the most common serotype was nontypeable, followed by non-b and b serotypes.

Non-b serotypes were significantly associated with bacteremia ($p=0.0031$). Nontypeable serotypes were significantly associated with bacteremia and meningitis ($p=0.0024$ and $p=0.0388$, respectively). None of the serotypes were significantly associated with a fatal outcome among cases of IHiD.

Since 2003, there have been 42 cases of IHiD in those less than five years of age. Of these cases, two (5%) were type b from 2003 and 2004. No cases of IHiD due to type b have been reported in this age group since 2004. Of the remaining cases, 26 (62%) were nontypeable, 13 (31%) were of a type other than type b, and 1 (2%) was unknown. Ninety percent of these 42 cases were hospitalized; the case fatality rate in this age group was 12%.

Figure 4: Serotype of IHiD Cases in Oregon

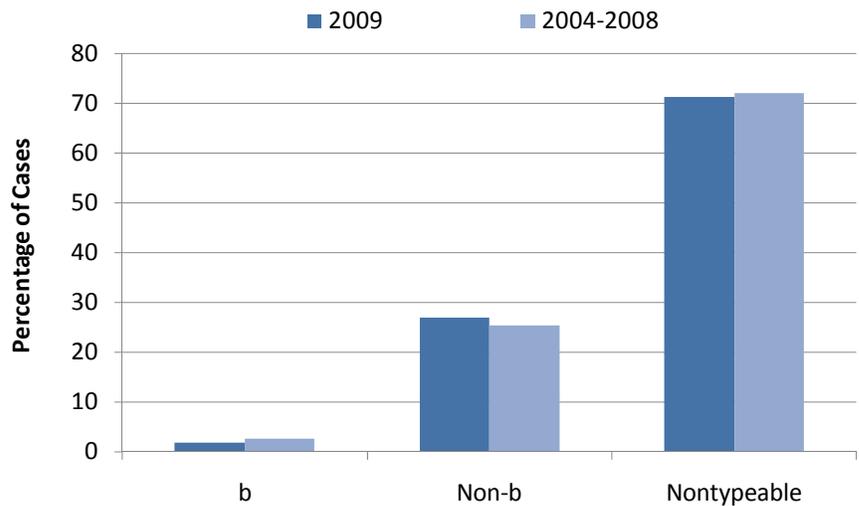
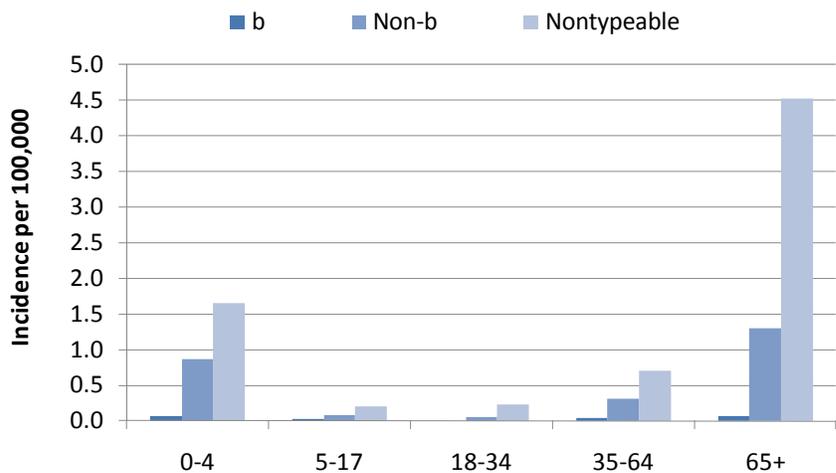


Figure 5: Serotype of IHiD Cases in Oregon by Age
2004-2009 six-year average



Discussion

H. influenzae serotype b (Hib) was once the leading cause of bacterial meningitis and a common cause of invasive bacterial disease among children less than 5 years of age in the United States. With the introduction of Hib vaccines during the mid to late 1980s, the incidence of invasive Hib disease in children less than 5 has decreased significantly leading to a notable change in the overall epidemiology of IHiD.² There has been increased recognition of non-serotype b and nontypeable cases in persons over 5 years of age, especially among those 65 years of age or older. In Oregon, our surveillance data confirm this overall trend. In the coming year, we will be participating in an extensive retrospective chart review of IHiD cases 65 years of age or older to better understand the burden of disease within this age group. We will continue to monitor these trends and work with other ABCs sites to better characterize the changing epidemiology of IHiD.

References

1. Centers for Disease Control and Prevention. 2010. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Haemophilus influenzae*, 2009. Available via the Internet: <http://www.cdc.gov/abcs/reports-findings/survreports/hib09.pdf>.
2. Centers for Disease Control and Prevention. Achievements in Public Health, 1990-1999 Impact of Vaccines Universally Recommended for Children – United States, 1990-1999. MMWR 1999; 48(12):243-8.