Haemophilus influenzae 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 *H. influenzae* 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 *H. influenzae* 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 *H. influenzae* disease (IHiD) is defined as the isolation of *H. influenzae* from a normally sterile body site in 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 then sent 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:

Burden of Disease

In 2007, 68 cases of IHiD were reported in Oregon, corresponding to an incidence rate of 1.8/100,000 persons (Figure 1). This is 28% higher than the average annual incidence rate in Oregon from 2002-2006 (1.4/100,000) and 13% higher than the most recent national projections of disease (1.6/100,000).[1] There were 12 IHiD deaths in 2007, for an annual mortality rate of 0.32/100,000 (Figure 1), 99% higher than the previous five-year average in Oregon (0.16/100,000) and 39% higher than the national mortality rate projection for IHiD.[1] The 2007 case fatality rate for IHiD in Oregon was 18%; higher than the 11% reported for Oregon from 2002-2006 and 15% based on national projections.[1] Of 68 cases where sex was known, 54% were male; of 53 cases where race was known, 100% were white; and of 37 cases where ethnicity was known, 14% were Hispanic or Latino.

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

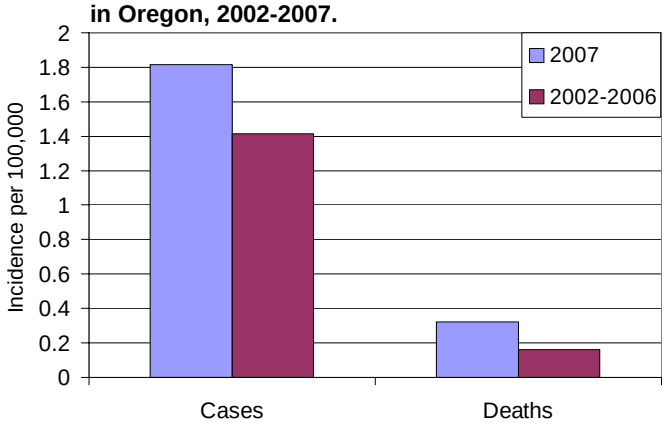
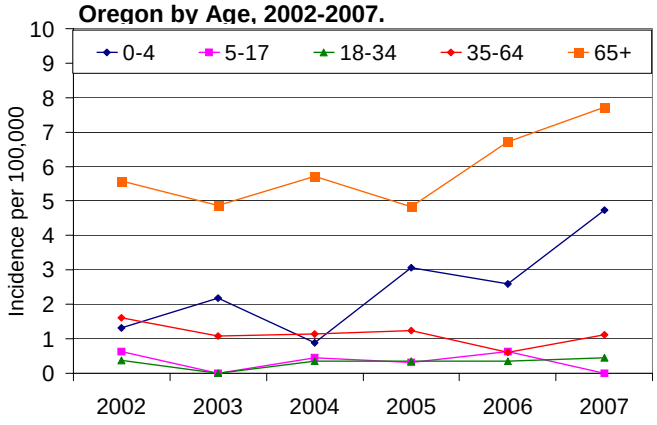


Figure 2: Incidence of IHiD Cases in Oregon by Age, 2002-2007.



The burden of IHiD in 2007 was highest (7.7/100,000) among those 65 years of age and older, followed by those from 0-4 years of age (4.7/100,000), consistent with historical patterns. (Figure 2) Since 2002, IHiD incidences among those under 5 and those 65 years and older have increased by 260% and 38%, respectively; those among other age groups have been largely stable. Mortality due to IHiD was highest among those 65 years of age and older (2.1/100,000), followed by those from 0-4 years of age (0.4/100,000). However, while IHiD mortality in 2007 was 248% higher than the previous 5-year average (0.62/100,000) in the eldest age group, mortality in the other age groups has remained relatively stable.

Clinical Manifestations

The top two clinical manifestations of IHiD reported in 2007 –bacteremic pneumonia (clinical pneumonia with a positive blood culture) and primary bacteremia – were reported among 66% and 21% of cases, respectively (Table 1). This is similar to historical patterns as the clinical syndrome profile has been roughly stable over the six year period. From 2002-2007, clinical manifestation of IHiD was not significantly associated with fatal outcome.

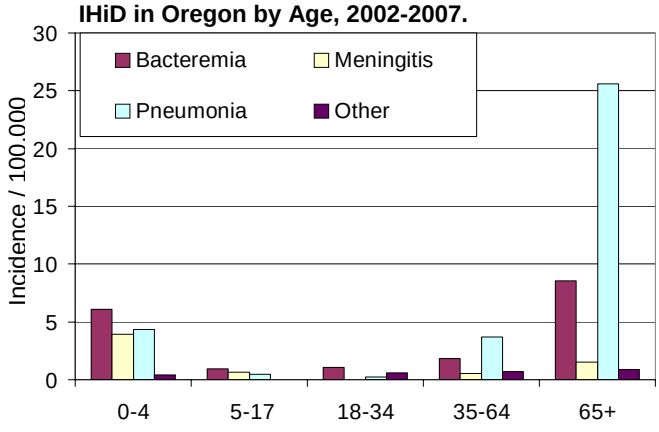
Table 1: Percent of IHiD cases reporting common clinical syndromes[†].

Syndrome	2007	2002-2006
Bacteremic Pneumonia	66	54
Primary Bacteremia	21	32
Meningitis	10	8
Other[††]	3	7

[†] Some cases report >1 syndrome.

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

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



From 2002-2007, bacteremia was the most common presentation among all persons less than 35 years of age, after which bacteremic pneumonia was more common. Meningitis was more common among younger individuals, the highest incidence and percentage of cases seen in those 0-4 and 5-17 years of age, respectively. Bacteremia and meningitis decreased with increasing age ($p=0.0017$ and $p<0.0001$, respectively), while bacteremic pneumonia increased with age ($p<0.0001$) to a maximum in those 65 years of age and older. Additionally, bacteremic pneumonia has been increasing among those 65 years of age and older since 2003 ($p=0.0011$) and, in 2007, this presentation was reported in 86% of all cases in this group.

Underlying Conditions

The most common underlying conditions reported among IHiD cases in 2007 were cardiovascular disease (38%), chronic obstructive pulmonary disease (COPD) (24%), cancer (21%), diabetes, (22%), smoking (12%), and immunosuppression (9%). This profile is similar to

the underlying condition profile seen for all cases reported since 2002. (Table 2). Cardiovascular disease, COPD, and cancer increase with increasing age, while the remaining underlying conditions are reported most frequently from those 35-64 years of age. No underlying risk factor was reported from 13% of cases, overall, although this varied considerably by age: 47% of cases under five years of age had no underlying conditions, in contrast to only 2% of cases 65 and over. Cardiovascular disease is the only condition associated with a fatal outcome from IHiD (p=0.0016).

Table 2: Underlying Conditions Reported Among IHiD Cases, 2002-2007 (n=322).

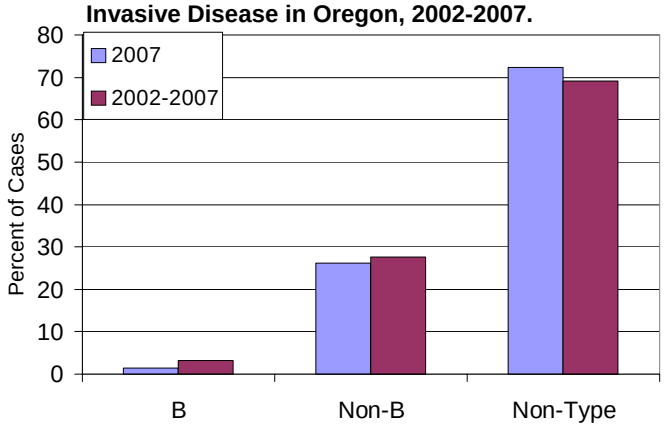
	N (%)
Cardiovascular Disease	95 (30)
COPD	71 (22)
Diabetes	59 (18)
Cancer	56 (17)
Smoking	44 (14)
Asthma	39 (12)
Immunosuppression	30 (9)
Alcohol Abuse	18 (6)
None	42 (13)

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 2007, serotyping was completed for 65 *H. influenzae* isolates (96%) causing invasive disease. Of these, one (2%) was type b, presenting as pneumonia in a 36-year old; 47 (72%) were non-typeable; and 17 (26%) were of a type other than type b (Figure 4). This was not significantly different from the serotype profile seen since 2002. No cases of IHiD due to type b or an unknown serotype have been reported in those less than five years of age since 2004 and 2005, respectively.

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



Discussion:

Prior to vaccine licensure, *H. influenzae* serotype b (Hib) was the leading cause of bacterial meningitis and retardation among infants. However, the development of a type b polysaccharide-protein conjugate vaccine and recommendations for vaccination of infants as young as 2 months of age has virtually eliminated Hib disease.[2] With zero cases of Hib reported among those less than five in the past three years, Oregon has reached the Healthy People 2010 goal of decreasing Hib disease to zero cases per 100,000 persons in this age group.[1] The primary focus of IHiD surveillance will continue to be the identification and characterization of Hib and unknown serotype IHiD in those less than five years of age to identify potential Hib vaccination failures.

However, recent IHiD surveillance results have also begun to identify an unsettling trend of increasing non-serotype b disease among the elderly – manifesting primarily as bacteremic pneumonia – and those less than five years of age. 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. 2008. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Haemophilus influenzae*, 2007-Provisional. Available via the Internet: http://www.cdc.gov/ncidod/dbmd/abcs/survreports/hib07.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.