# *Haemophilus influenzae* Surveillance Report 2008

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 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 over 38 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 of Oregon with a 2008 estimated population of 3,791,075. More information on the Oregon ABCs program is found at: http://www.oregon.gov/DHS/ph/acd/abc.shtml.

## Methods

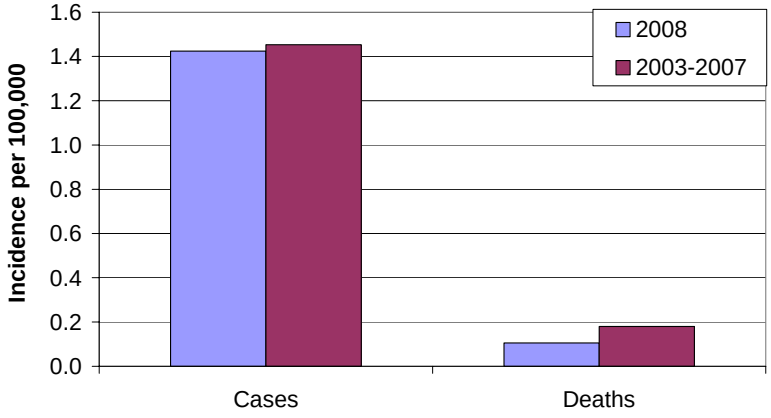
Invasive *H. influenzae* disease (IHiD) is defined as the isolation of *H. influenzae* from a normally sterile body site in a resident of Oregon. Since IHiD is reportable in Oregon, hospital laboratories submit sterile-site *H. influenzae* microbiology isolates to the Oregon State Public Health Laboratory for serotyping. Additional cases are identified through regular laboratory record reviews. Isolates are 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

*Descriptive Epidemiology*

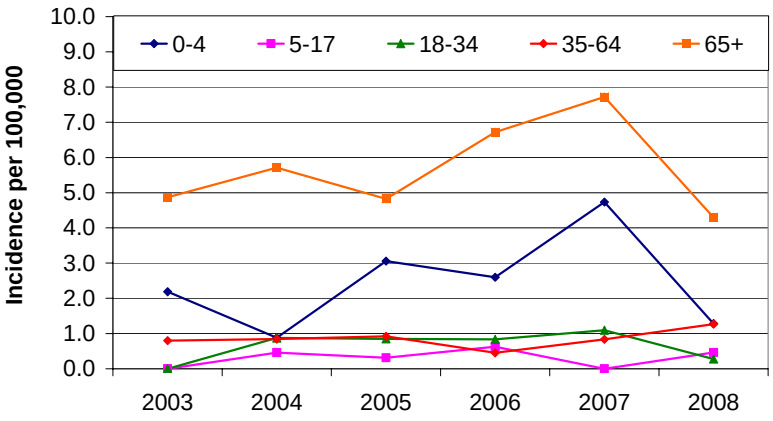
In 2008, 54 cases of IHiD were reported in Oregon, corresponding to an incidence rate of 1.4/100,000 persons (Figure 1). This is similar to the average annual incidence rate in Oregon from 2003-2007 (1.5/100,000) and 13 percent lower than the most recent national projections of disease (1.6/100,000).[1] There were 4 IHiD deaths in 2008, for an annual mortality rate of 0.11/100,000 (Figure 1), 39 percent lower than the previous five-year average in Oregon (0.18/100,000) and 50 percent lower than the national mortality rate projection for IHiD (0.22/100,000).[1] The 2008 case fatality rate for IHiD in Oregon was 7 percent; lower than both the 12 percent reported for Oregon from 2003-2007 and 14 percent based on national projections.[1] Of 54 cases where sex was known, 48 percent were male; of 38

**Figure 1: Incidence of IHiD Cases and Deaths in Oregon, 2003-2008.**



cases where race was known, 100 percent were white; and of 34 cases where ethnicity was known, 18 percent were Hispanic or Latino.

**Figure 2: Incidence of IHiD Cases in Oregon by Age, 2003-2008.**




The burden of IHiD in 2008 was highest (4.3/100,000) among those 65 years of age and older, followed by those 0-4 and 35-64 years of age (1.3/100,000 for both age groups), consistent with historical patterns (Figure 2). From 2003 to 2007, IHiD incidences among those under five and those 65 years and older increased by 116 percent and 59 percent, respectively. However, in 2008, the incidences among these two age groups returned to levels lower than the previous 5-year averages. Other age groups have remained largely stable over the last six years. Although mortality due to IHiD in 2008 was highest among those 65 years of age and older (0.20/100,000), this rate was 91 percent lower than the age-specific mortality rate in 2007 (2.14/100,000) and 77 percent lower than the age-specific previous 5-year average (0.87/100,000).

*Clinical Manifestations*

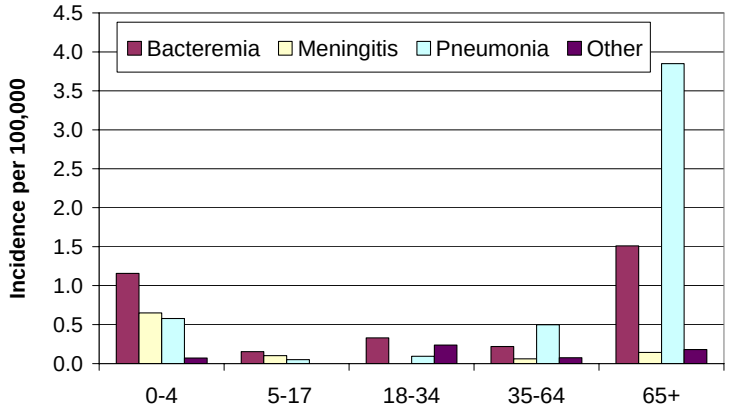
The top two clinical manifestations of IHiD reported in 2008 – bacteremic pneumonia (clinical pneumonia with a positive blood culture) and primary bacteremia – were reported among 56 percent and 39 percent of cases, respectively (Table 1). Although the clinical syndrome profile of IHiD has been roughly stable over the six year period, meningitis in 2008 was significantly different compared to the previous 5-year average (p=0.0044). From 2003-2008, clinical manifestation of IHiD was not significantly associated with fatal outcome.

**Table 1: Percent of IHiD Cases[†] Reporting Common Clinical Syndromes, 2003-2008.**

| Syndrome | 2008 | 2003-2007 |
|---|---|---|
| Bacteremic Pneumonia | 56 | 56 |
| Primary Bacteremia | 39 | 29 |
| Meningitis | 2 | 9 |
| Other[††] | 4 | 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, 2003-2008 six-year average.**




From 2003-2008, bacteremia was the most common presentation among all persons less than 35 years of age, followed by meningitis and then bacteremic pneumonia (Figure 3). Meningitis was more common among younger individuals, with 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=0.0014 and p<0.0001, respectively), while bacteremic

pneumonia increased with age (p<0.0001). Although bacteremic pneumonia had been increasing among those 65 years of age and older since 2003, the incidence of cases in this elderly age group actually decreased by 60 percent from 2007 (6.6/100,000) to 2008 (2.7/100,000). This fluctuation will continue to be monitored by our surveillance program.

*Underlying Conditions*

The most common underlying conditions reported among IHiD cases in 2008 were cardiovascular disease (28%), smoking (24%), diabetes (22%), chronic obstructive pulmonary disease (COPD) (19%), cancer (17%), immunosuppression (17%), asthma (13%), and alcohol abuse (7%). This profile is similar to the underlying condition profile seen for all cases reported since 2003 (Table 2). 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. Sixty-seven percent of cases less than five years of age had no underlying conditions, in contrast to only 10 percent of cases 65 and over. Cardiovascular disease is the only condition associated with a fatal outcome from IHiD (p=0.0026).

**Table 2: Underlying Conditions Reported Among IHiD Cases, 2003-2008 (n=325).**

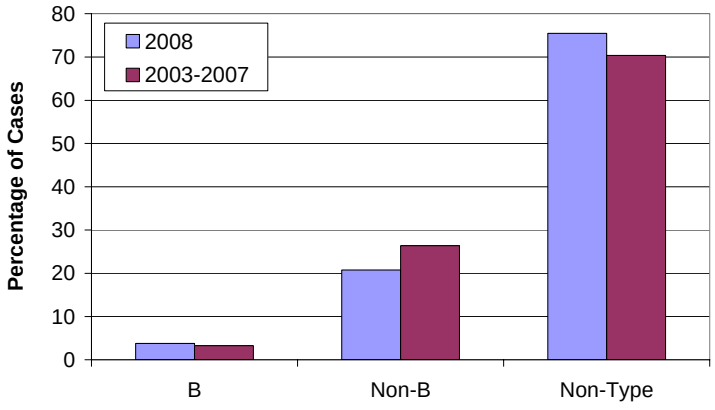
| | N (%) |
|---|---|
| Cardiovascular Disease | 103 (32) |
| COPD | 71 (22) |
| Diabetes | 59 (18) |
| Cancer | 57 (18) |
| Smoking | 52 (16) |
| Asthma | 38 (12) |
| Immunosuppression | 36 (11) |
| Alcohol Abuse | 18 (6) |
| None | 42 (13) |

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 2008, serotyping was completed for 53 (98%) *H. influenzae* isolates causing invasive disease. Of these, two (4%) were nonfatal cases of type b. The first case presented as pneumonia in a 54-year old male with no underlying conditions, hospitalized for five days. The second case presented as epiglottitis in a 43-year old female with no underlying conditions who was hospitalized for one day. Of the remaining IHiD isolates, forty (75%) were non-typeable and 11 (21%) were of a type other than type b (Figure 4). This was not significantly different from the serotype profile of cases reported during the previous five years. None of the serotypes were significantly associated with a fatal outcome among cases of IHiD or associated with clinical manifestations of IHiD.

**Figure 4: Serogroup of *H. influenzae* Causing Invasive Disease in Oregon, 2003-2008.**




Since 2003, there have been 35 cases of IHiD in those less than five years of age. Of these, two (6%) 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, twenty (57%) were non-typeable, 12 (34%)

were of a type other than type b, and 1 (3%) was unknown. Almost 90 percent of these 35 cases were hospitalized and over 90 percent of these cases survived.

## 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 have virtually eliminated Hib disease.[2] With zero cases of Hib reported among those less than five in the past four 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.

Although recent IHiD surveillance results had begun to identify an unsettling trend of increasing non-serotype b disease among the elderly and those less than five years of age, we actually observed decreasing numbers in 2008. We will continue to monitor these fluctuations and work with other ABCs sites to better characterize the changing epidemiology of IHiD.

## References


1. Centers for Disease Control and Prevention. 2009. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Haemophilus influenzae*, 2008. Available via the Internet: http://www.cdc.gov/abcs/reports-findings/survreports/hib08.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.