# *Haemophilus influenzae* Surveillance Report 2011

Oregon Active Bacterial Core Surveillance (ABCs)

Center for Public Health Practice

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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 almost 42 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 2011 estimated population of 3,857,625.* More information on the Oregon ABCs program is found at: http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/EmergingInfections/Pages/ActiveBacterialCoreSurveillance.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 2011, 74 cases of IHiD were reported in Oregon, corresponding to an incidence rate of 1.92/100,000 persons (Figure 1). This is 22 percent higher than the average annual incidence rate in Oregon during the previous five years (1.57/100,000) and 16 percent higher than the most recent national estimate of disease (1.65/100,000).[1] Almost 95 percent of IHiD cases in 2011 were hospitalized, slightly higher than the previous five-year average rate of hospitalization (92 percent).

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

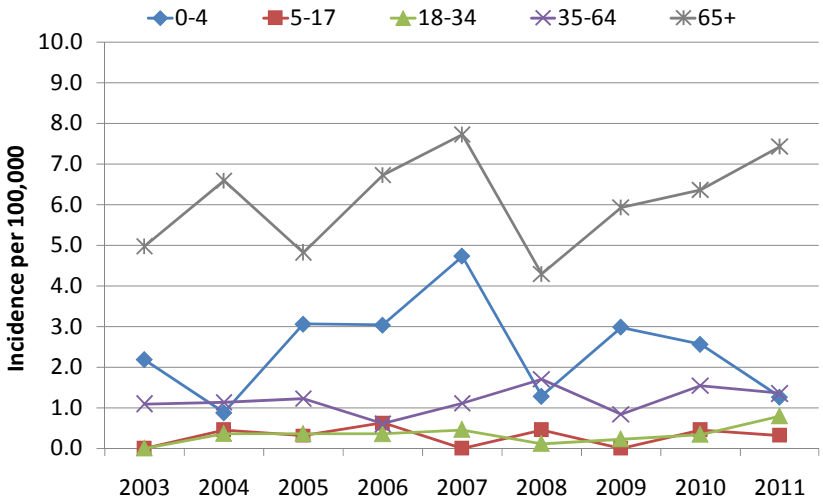
There were 10 IHiD deaths in 2011, for an annual mortality rate of 0.26/100,000, 13 percent higher than the previous five-year average in Oregon (0.23/100,000) and 4 percent lower than the national mortality rate projection for IHiD (0.27/100,000).[1]

The 2011 case fatality rate for IHiD in Oregon was 14 percent, which is equivalent to the figure reported for Oregon from 2006-2010, and 18 percent lower than the national rate of 17 percent in 2011 based on national projections.[1]

Forty-two percent of cases were male; of 62 cases where race was known, 97 percent were white; and of 49 cases where ethnicity was known, none were Hispanic or Latino.

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


**Figure 2: Incidence of IHiD Cases in Oregon by Age**




Consistent with historical patterns, the burden of IHiD in 2011 was highest (7.42/100,000) among those 65 years of age and older, followed by those 35–64 (1.35/100,000) and 0–4 (1.26/100,000) (Figure 2). Other age groups have remained largely stable over the last few years.

Mortality due to IHiD in 2011 was highest among those 65 years of age and older (1.27/100,000), almost 32 percent higher than the age-specific mortality rate in 2010 (0.96/100,000) and 19 percent higher than the age-specific previous 5-year average (1.07/100,000).

**Clinical Manifestations**

The top two clinical manifestations of IHiD reported in 2011 – bacteremic pneumonia (clinical pneumonia with a positive blood culture) and primary bacteremia – were reported among 70 percent and 16 percent of cases, respectively (Table 1). The clinical syndrome profile of IHiD has been roughly stable over the six year period. No significant differences were detected between clinical syndromes in 2011 compared to their respective previous 5-year averages. From 2006-2011, clinical manifestation of IHiD was not significantly associated with fatal outcome.

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

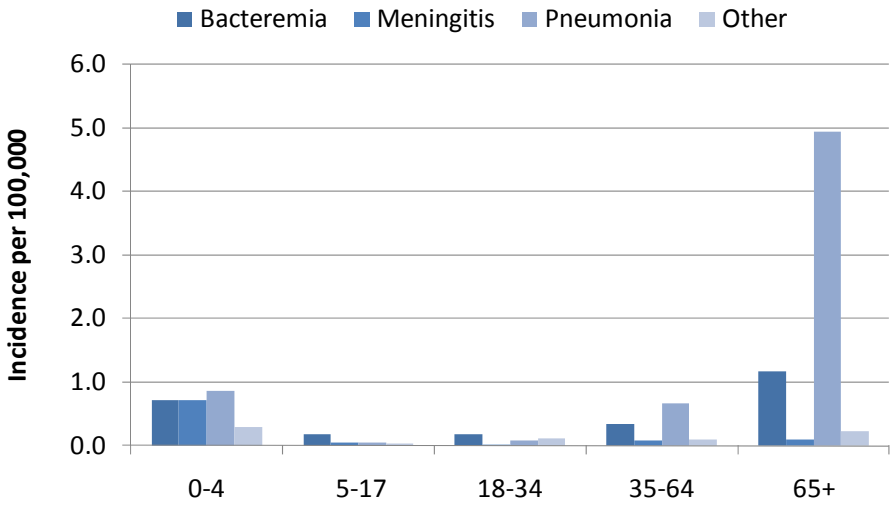
| Syndrome | 2011 | 2006-2010 |
|---|---|---|
| **Bacteremic pneumonia** | 70 | 59 |
| **Primary bacteremia** | 16 | 28 |
| **Meningitis** | 7 | 6 |
| **Other††** | 8 | 7 |

† Some cases report more than 1 syndrome.

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

From 2006-2011, bacteremia was the most common presentation among those 5–34 years of age, while bacteremic pneumonia was most common among all other age groups (Figure 3).

**Figure 3: Clinical Manifestation of IHiD in Oregon by Age**
**2006-2011 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**

In 2011, the most commonly identified underlying conditions or risk behaviors among IHiD cases were cardiovascular disease (35%), diabetes (31%), and chronic obstructive pulmonary disease (COPD) (26%). With the exception of cancer (p=0.0024) which was *less* prevalent among cases in 2011 and diabetes (p=0.0224) which was *more* prevalent among cases in 2011 than in earlier years, this profile was not significantly different from the profile of underlying conditions seen for cases reported during the previous five years (Table 2).

**Table 2: Underlying Conditions Reported Among IHiD Cases**

| Underlying Condition | 2011 only (n=74) N (%) | 2006-2010 (n=296) N (%) |
|---|---|---|
| **Alcohol abuse** | 5 (7) | 18 (6) |
| **Asthma** | 6 (8) | 31 (11) |
| **Cancer** | 4 (5) | 47 (16) |
| **Cardiovascular disease** | 26 (35) | 89 (30) |
| **COPD** | 19 (26) | 73 (25) |
| **Diabetes** | 23 (31) | 56 (19) |
| **Immunosuppression** | 7 (10) | 34 (12) |
| **Obesity** | 11 (15) | 26 (9) |
| **Smoking** | 15 (20) | 60 (20) |
| **None** | 5 (7) | 45 (15) |

Cancer, cardiovascular disease, COPD, and diabetes were reported most frequently among IHiD cases 65 years and over, while alcohol abuse, immunosuppression, obesity, and smoking were greatest among IHiD cases 35–64 years of age. Asthma was the only condition reported most frequently among those 5–17 years.

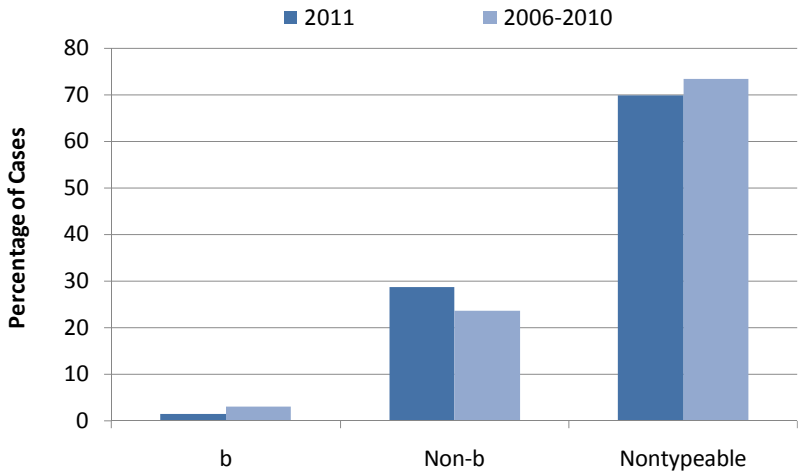
No underlying risk factors were reported for 14 percent of cases, although this varied considerably by age. Forty-seven percent of cases less than five years of age had no underlying conditions, in contrast to only 7 percent of cases 65 and over.

After controlling for age, no conditions were associated with a fatal outcome from IHiD and obesity was the only condition to be a significant predictor of clinical manifestation, specifically meningitis (p=0.0047).

## Serotype Analysis

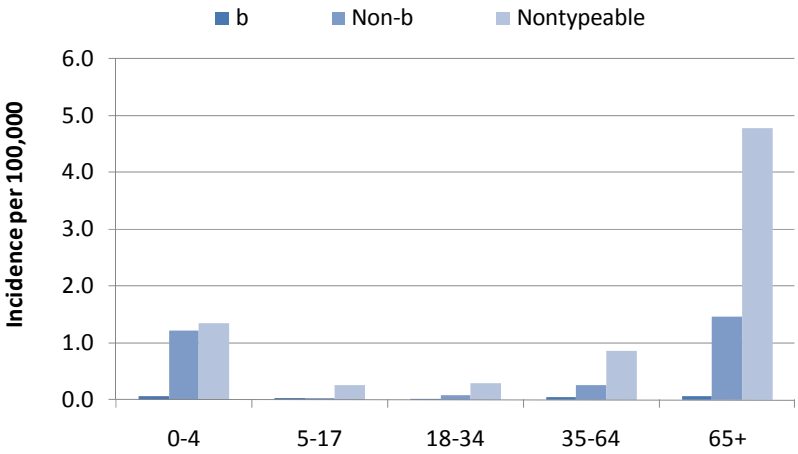
In 2011, serotyping was completed for 73 (99%) *H. influenzae* isolates causing invasive disease. Of these, there was one nonfatal case of type b in a 31-year old female with no underlying conditions, hospitalized for nine days. Since 1995, there have been 34 cases of serotype b infection, eight of which occurred in children less than five. Until 2010, there had been no cases in this young age group since 2004.

**Figure 4: Serotype of IHiD Cases in Oregon**




Of the remaining IHiD isolates, 51 (70%) were nontypeable and 21 (29%) 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. Among each age group, the most common serotype was nontypeable, followed by non-b and b serotypes (Figure 5).

**Figure 5: Serotype of IHiD Cases in Oregon by Age 2006-2011 six-year average**




None of the serotypes were significantly associated with fatal outcome. After controlling for age, both nontypeable and other non-b serotypes were significantly associated with bacteremia. Nontypeable cases were positively associated with bacteremia (OR 2.6; [CI] 1.4, 4.8), while other non-b serotypes were negatively associated with bacteremia (OR 0.4; [CI] 0.2, 0.8).

## 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. We are currently 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. 2012. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Haemophilus influenzae*, 2010. Available via the Internet: http://www.cdc.gov/abcs/reports-findings/survreports/hib10.pdf. Accessed 4 September 2012.
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.