

Current Epidemiology and Trends in Invasive *Haemophilus influenzae* Disease—United States, 2009–2014

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Background

Haemophilus influenzae (Hi)

- Gram-negative bacteria
- Can cause severe invasive disease; can be fatal
- Most common presentations
 - Meningitis
 - Bacteremia
 - Bacteremic pneumonia
- Transmission
 - Respiratory droplets from patients or asymptomatic carriers
 - From mother to child during birth
- Hi bacteria can be encapsulated, with 6 known serotypes (a, b, c, d, e, f)
 - Serotype b *H. influenzae* = Hib
 - Unencapsulated Hi bacteria are called nontypeable (NT)
- Currently, vaccines are only available to prevent Hib.
 - Hib vaccine was introduced in the 1980s and reduced Hib incidence among children aged <5 years by >99%.¹⁻⁴
 - There are no vaccines for other Hi serotypes or nontypeable strains.

Objective

- To estimate recent national trends in invasive Hi disease, 2009-2014

Methods

Data source: Active Bacterial Core surveillance (ABCs)⁵

- Part of the CDC's Emerging Infections Program
- Active laboratory- and population-based surveillance system for 8 invasive bacterial pathogens, including Hi
- 10 surveillance sites across the US, covering a population of ~43 million, representing 13.5% of the US population in 2014.
- Case definition:
 - Isolation of Hi from a normally sterile site
 - Hierarchical syndrome classification:
 - Meningitis: clinical diagnosis of meningitis or Hi isolated from cerebrospinal fluid
 - Bacteremia: Hi isolated from blood and no localized clinical syndrome
 - Bacteremic pneumonia: clinical pneumonia and Hi isolated from blood or pleural fluid
- Isolates were serotyped via slide agglutination and real-time PCR.

Statistical Methods

- Observed ABCs cases were used to estimate national incidence rates per 100,000, standardized for race and age.
- Case-fatality ratios were calculated using cases with known outcomes as the denominator.

Results

Figure 1. Annual estimated incidence of *H. influenzae*, United States, 1999-2014

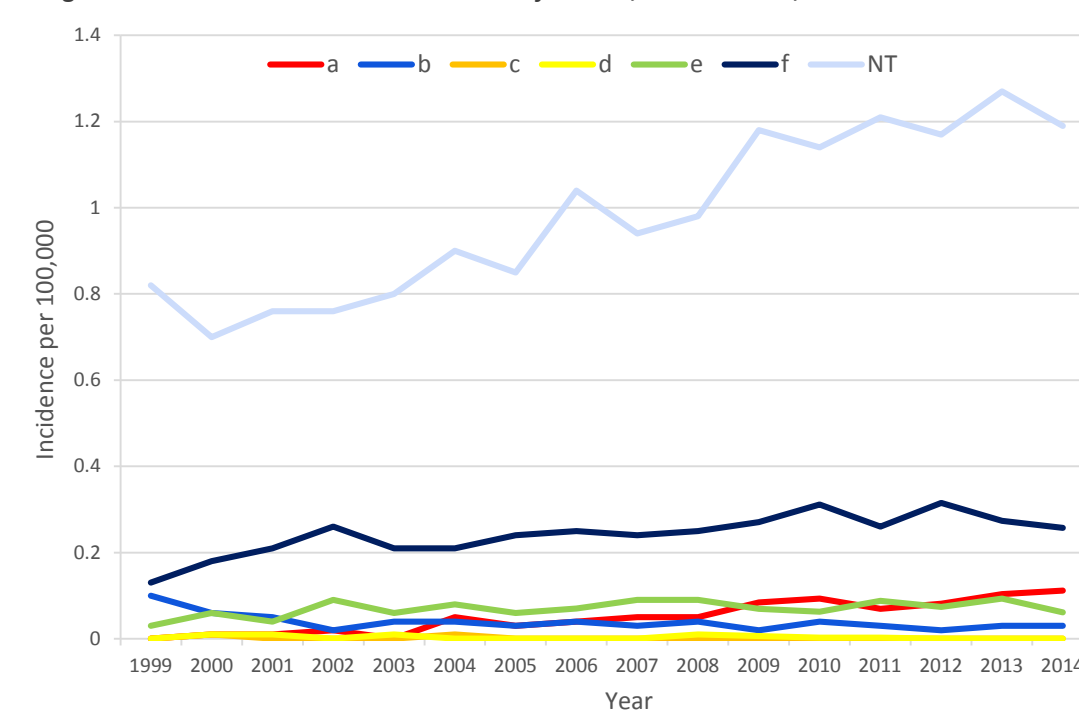


Table 1. Annual estimated U.S. incidence of all *H. influenzae* by age group and race, 2009-2014

| Age (years) | White | Black | AI/AN | Asian | Total |
|--------------|------------|------------|------------|------------|------------|
| <1 | 7.6 | 10.5 | 38.5 | 5.5 | 8.5 |
| 1-4 | 1.1 | 2.2 | 10.9 | 0.9 | 1.5 |
| 5-64 | 0.8 | 1.1 | 1.4 | 0.4 | 0.8 |
| ≥65 | 6.5 | 5.6 | 10.4 | 3.4 | 6.3 |
| Total | 1.7 | 1.7 | 3.4 | 0.8 | 1.7 |

Figure 2. Total *H. influenzae* case fatality by age group, 2009-2014

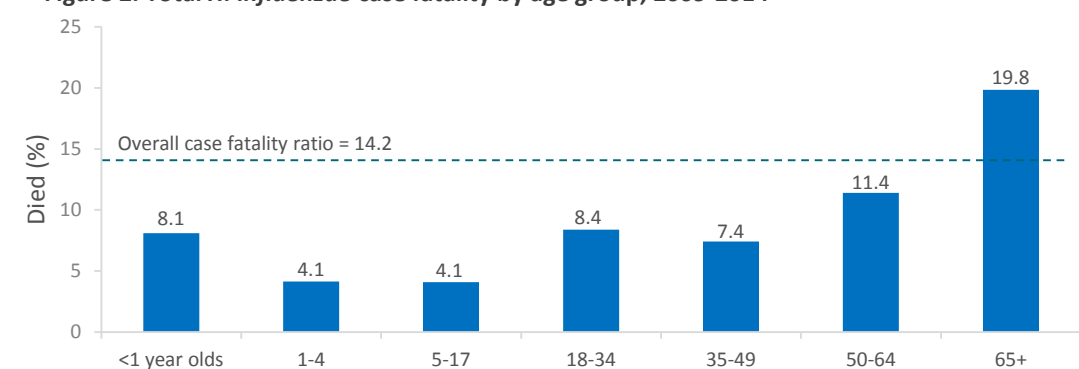


Figure 3. Estimated U.S. incidence of *H. influenzae* by age group and serotype, 2009-2014

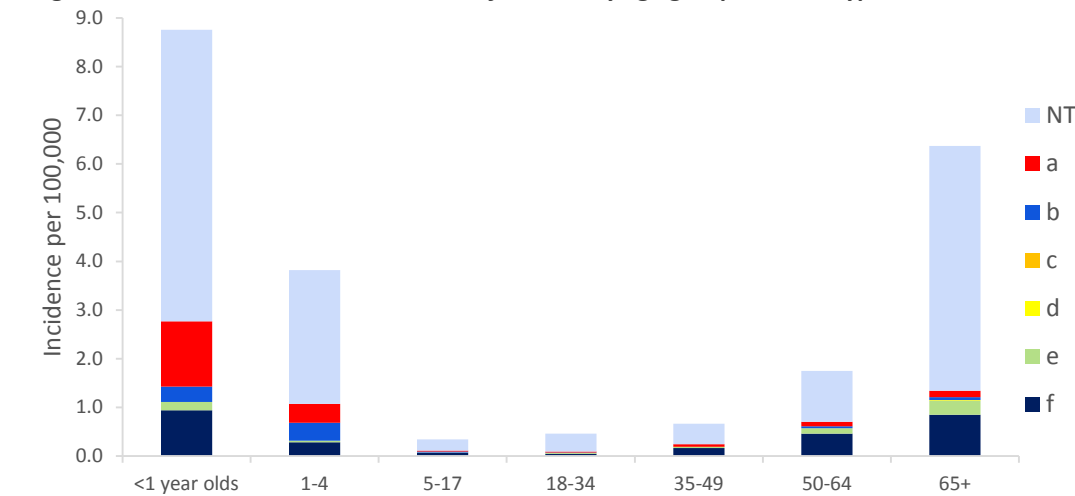


Figure 4. Clinical syndromes of invasive *H. influenzae* disease by age group, 2009-2014

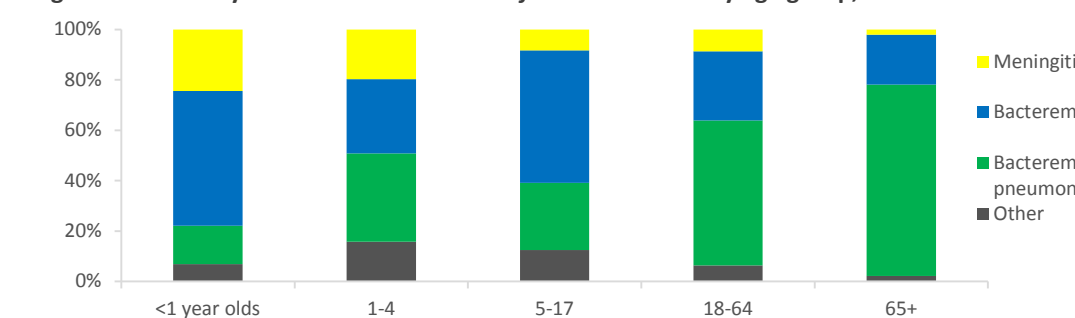


Table 2. Change in average annual incidence of *H. influenzae* serotypes, 1999-2008⁶ vs. 2009-2014

| Serotype | 1999-2008 Average annual incidence ⁶ | 2009-2014 Average annual incidence | Percent change in incidence |
|--------------|--|---------------------------------------|--------------------------------|
| Hib | 0.05 | 0.03 | -40% |
| Non-b | 0.38 | 0.45 | 18% |
| a | 0.03 | 0.09 | 193% |
| c | 0.004 | 0 | -100% |
| d | 0.005 | 0.0001 | -97% |
| e | 0.08 | 0.07 | -7% |
| f | 0.26 | 0.28 | 9% |
| Nontypeable | 0.99 | 1.19 | 20% |
| Total | 1.42 | 1.67 | 18% |

Results, cont.

- 93% of Hi patients were hospitalized
 - Median duration of hospitalization: 6 days (range: 0-157 days)
- Hib disease
 - 22 Hib cases in children <5 were reported to ABCs in 2009-2014
 - 43% meningitis, 24% bacteremic pneumonia, 14% bacteremia, 19% other presentations
 - Vaccination status: 9% too young, 27% age-appropriately vaccinated, 32% unvaccinated, 32% undervaccinated (most only missing the booster dose)

Conclusions

- Invasive Hi mainly affects the extreme age groups (<5 and ≥65 years)
- Case fatality is highest in older adults and increases with increasing age⁷
- American Indian/Alaska Natives have highest burden of Hi
 - Especially among children
- Nontypeable Hi causes the highest incidence across all ages
- Hib incidence remains very low
 - Most Hib cases are unvaccinated or under-vaccinated
- Changes in invasive Hi disease since 1999-2008:
 - Nontypeable incidence continues to increase
 - Serotype f is most common; incidence increased slightly
 - Serotype a increased substantially
 - Incidence of all other serotypes decreased
- Analyses to further describe the epidemiology and clinical presentations of serotype a disease are in progress

References

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