

# Decline in bacterial meningitis in Finland, 1995-2014 - a population-based observational study

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## Bacterial meningitis

- Epidemiology is changing
- Empiric antimicrobial treatment based on local epidemiology, patient's age, risk factors
- In Finland: universal conjugate vaccination against Hib in 1986 and pneumococcal disease in 2010 (PCV10)

## Aims

- Assess the contribution of specific pathogens to the total bacterial meningitis disease burden in Finland
- Assess long-term trends in the incidence of common etiologies during 1995-2014

## Materials and Methods

### Data sources

- Population-based laboratory surveillance data from National Infectious Disease Register (NIDR, 1995-2014)
- Serotype/group data on isolates from THL Reference Laboratory (2004-2014)

### Case definitions

- Isolation of *S. pneumoniae*, *S. agalactiae* (GBS), *N. meningitidis*, *L. monocytogenes* or *H. influenzae* from cerebrospinal fluid (CSF) and notified to NIDR during 1995-2014
- Case fatality proportion (CFP): death within 30 days from the first positive CSF culture

### Statistics

- Chi-square analyses: to assess changes in case fatality proportion
- Wilcoxon rank-sum test: to compare age distribution of cases across years
- Poisson regression or negative binomial regression: to test for log-linear trend in rates of bacterial meningitis 1995-2014

## Results

- During 1995-2014, total 1361 reported bacterial meningitis cases (1.29 cases/100000 population)
- *S. pneumoniae* and *N. meningitidis*: 78% of cases
- GBS: 40% of cases in <2 years of age (Fig.1)
- Median age increased: 31 years in 1995-2004 vs.43 years in 2005-2014
- Rates higher in men than women (1.52 vs 1.07 cases/100000 population; Incidence rate ratios 1.42)
- Decreasing trend in rates of *N. meningitidis* and *S. pneumoniae* (Fig.2 and Tab 1)
- No change in CFP from 2004-2009 (10.6%) to 2010-2014 (9.6%)

Fig 1. Proportions of bacterial meningitis cases caused by each pathogen according to age group, Finland, 1995-2014

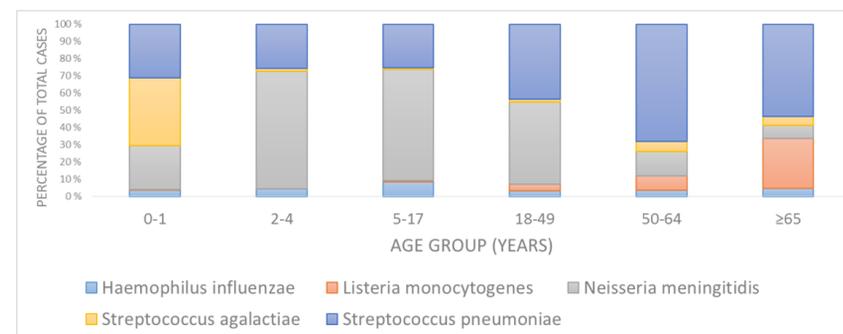
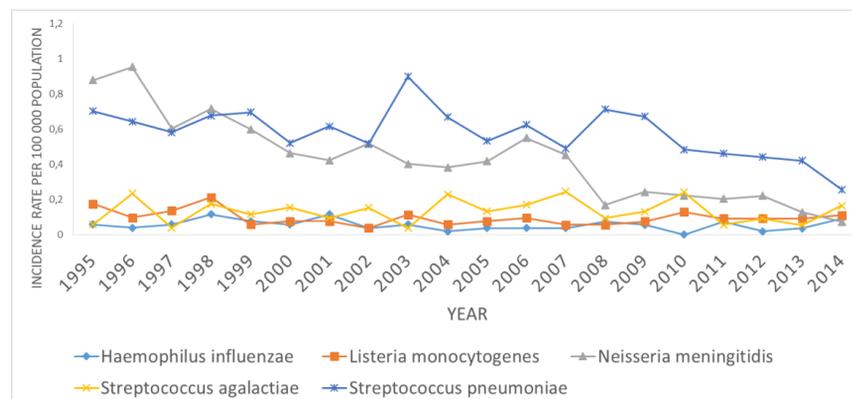


Fig. 2 Incidence rate (per 100 000) of bacterial meningitis by year and pathogen, Finland, 1995-2014



Tab.1. Relative change in the mean incidence and 95% CI for bacterial meningitis, Finland, 1995-2014

Age group (years)	Relative change (%)
<2	-2% (-4%; -1%)
2-4	-5% (-10%; 0%)
5-17	-8% (-12%; -4%)
18-49	-7% (-8%; -5%)
50-64	-4% (-6%; -2%)
≥65	-1% (-4%; 1%)
Overall	-4% (-3%; -5%)
Pathogen	Relative change (%)
<i>S. pneumoniae</i>	-2% (-4%; -1%)
<i>N. meningitidis</i>	-9% (-10%; -7%)
<i>S. agalactiae</i>	0% (-3%; 3%)
<i>L. monocytogenes</i>	-2% (-5%; 1%)
<i>H. influenzae</i>	-2% (-7%; 2%)

## Conclusions

- Decline in incidence rate of pneumococcal meningitis likely associated with introduction of PCV10 into infant vaccination programme
- Decrease in incidence of *N. meningitidis* greater than for pneumococcal meningitis, although no routine vaccination programme
- Increase in median age due to decrease in rates in children
- Higher rates in males possibly because of higher prevalence of underlying conditions such as smoking and alcoholism
- Continuing surveillance needed to assess long-term vaccine impact and to develop future vaccination strategies