

# Epidemiology and surveillance of meningococcal disease in Germany

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## Background

All forms of invasive meningococcal disease (IMD) have been statutorily notifiable in Germany since implementation of the Protection Against Infection Act (IfSG) in 2001. Aggregate data on cases of meningococcal meningitis are available dating back to 1910. Outlined here are the methods used to ascertain number of cases and conclusions that can be drawn from the pattern of incidence since 2001.

## Methods

According to IfSG, clinicians diagnosing meningococcal meningitis or sepsis and laboratories identifying *Neisseria meningitidis* from a normally sterile site are required to report cases to regional health authorities. All cases fulfilling the case definition (implemented since 2001) are relayed to the health state authority level, and from there to the national level at the Robert Koch Institute (RKI).

Almost all reported cases are laboratory confirmed; ~1% of cases are clinically and epidemiologically confirmed. The proportion of cases missing serogroup data decreased from 49.2% in 2001 to 15.2% in 2004. Serogroup specific incidence was adjusted accordingly by assuming the serogroup distribution among cases with unknown serogroup was similar to the distribution among cases with known serogroup.

Laboratories are encouraged to send isolates or samples to the NRZM for confirmation, fine typing (Serogroup:PorA:FetA), and antibiotic sensitivity testing. This is instrumental in identification of disease clusters by means of scan statistics, international comparison of data, and surveillance of antigenic variants circulating in the country.

## Results

### Temporal pattern of IMD

IMD occurs with a typical seasonal pattern in Germany, with disease activity increasing in fall and peaking in winter during the first quarter. During 2001-2004, 36.7% of cases occur in the 1st quarter, 24.8% in the 2nd, 22.1% in the third, 16.5% in the fourth.

### IMD Incidence

The incidence of IMD in Germany was 0.9 cases /100.000 population in 2001-2003 and decreased to 0.7 cases/100.000 population in 2004. Serogroup B disease predominates in Germany. The proportion of serogroup C disease increased from 20% in 2001 to 27.8% in 2002 and 2003, remaining stable at 27.3% in 2004.

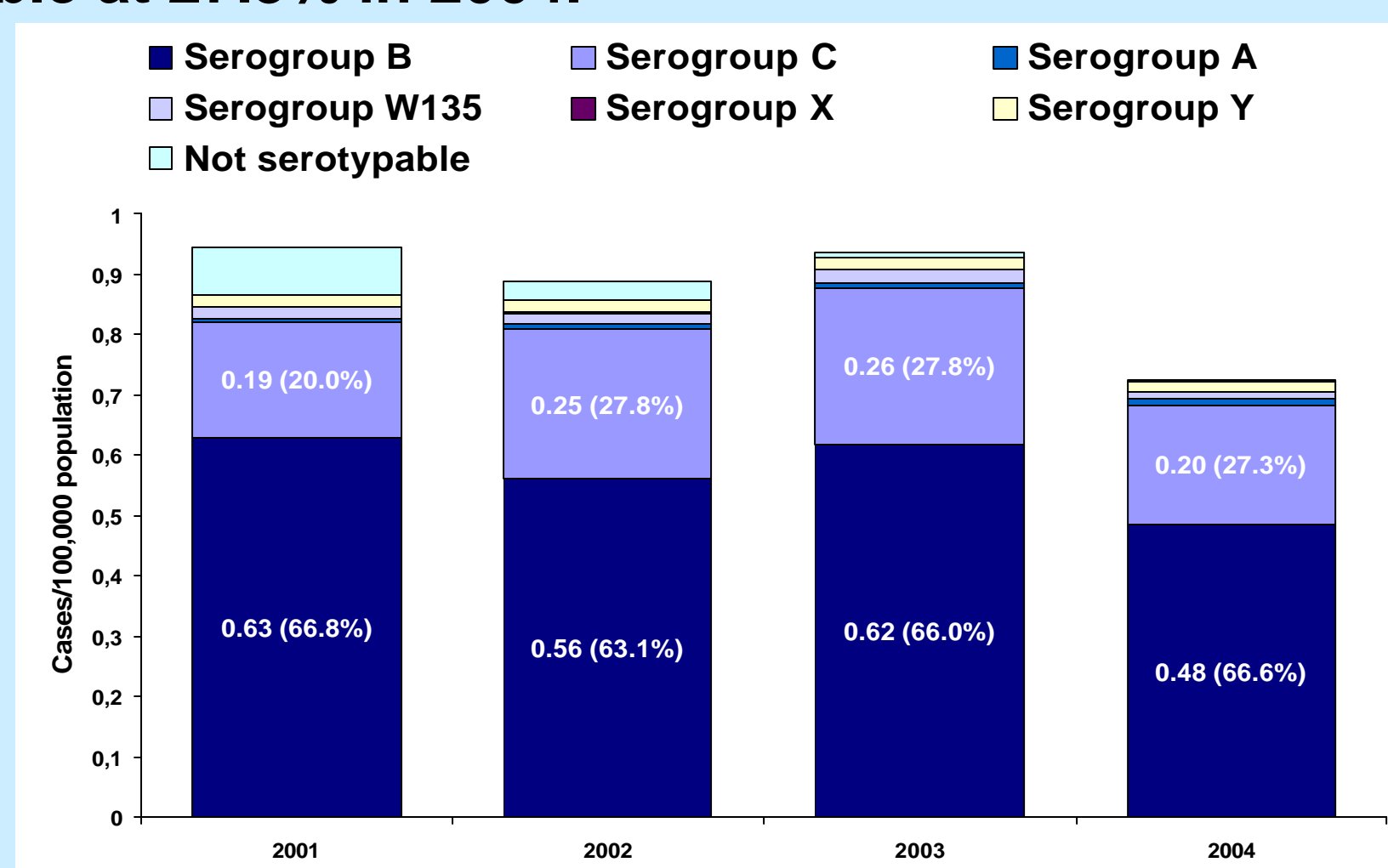


Fig. 1: Incidence of invasive meningococcal disease according to serogroup, Germany, 2001-2004

## Results, cont.

The incidence of IMD in Germany from 2001 to 2004 was highest in infants and 1-year olds, with a secondary incidence peak in 15-19 year olds (Fig. 3). The increase in the proportion of Group C disease observed from 2001 to 2002 was distributed among all age groups (not shown).

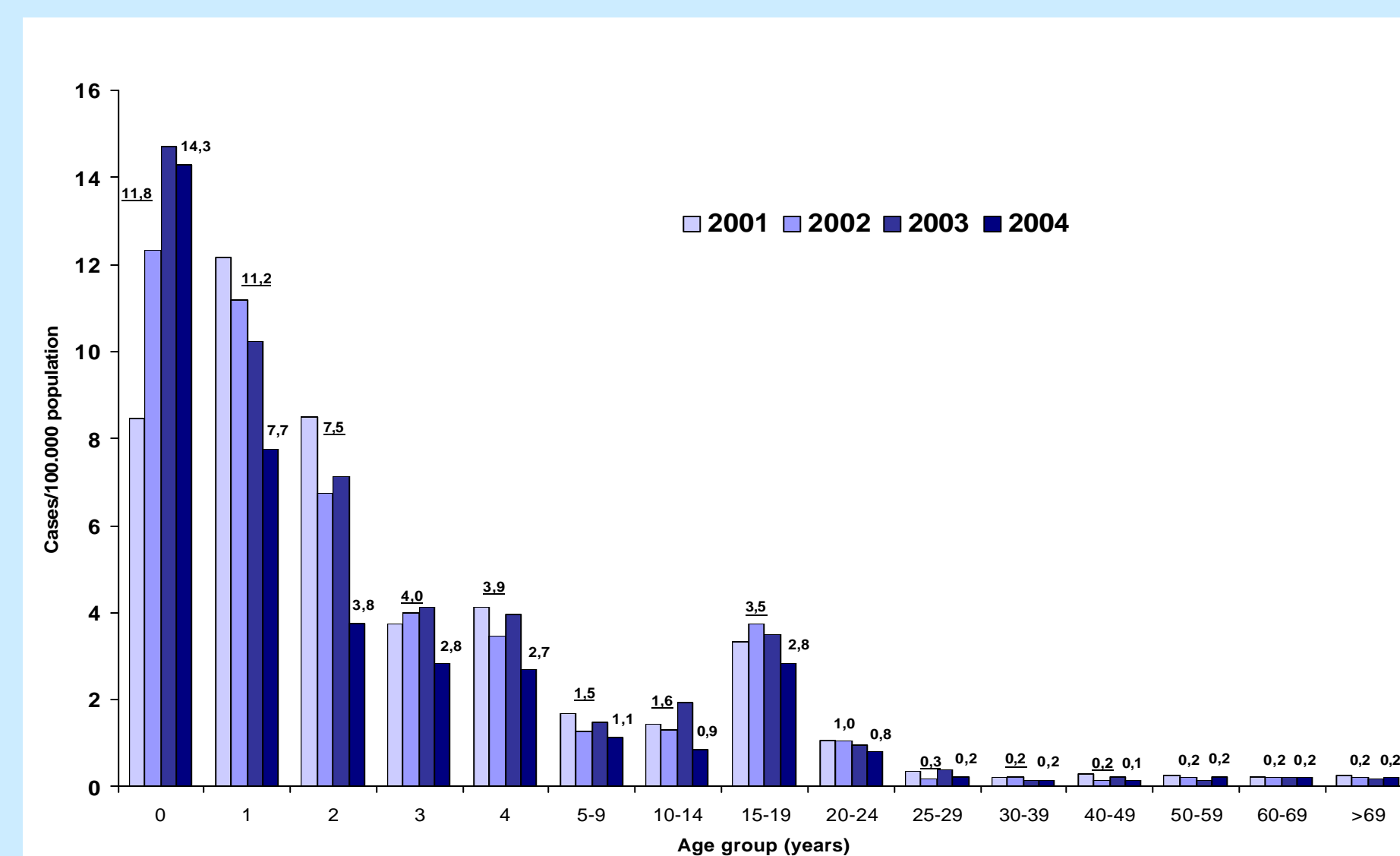


Fig. 3: Age specific incidence of IMD, Germany, 2001-2004. Figures above the bars depict the mean incidence during this time.

### Geographic distribution of IMD

The mean total IMD incidence in the 16 German federal states ranged from 0.7 to 1.4 per 100.000. Group B incidence was highest in northern and mideastern states and Northrhine-Westfalia. Group C incidence, while also high in some of the same states, was comparatively higher in the more southern than northern states.

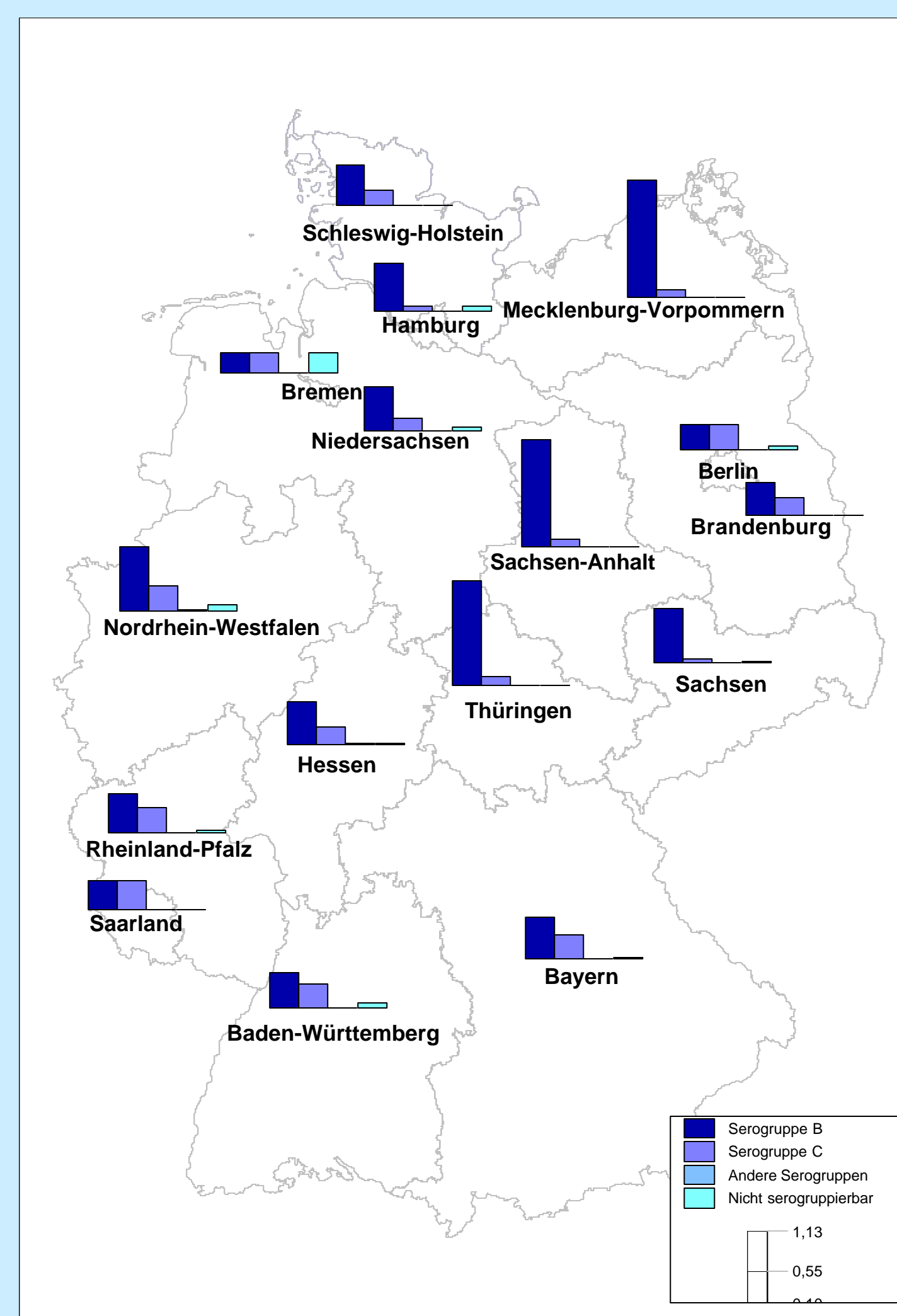


Fig. 4: Mean serogroup specific IMD incidence according to federal State, Germany, 2001-2004

## Results, cont.

### Case fatality

Overall case fatality was higher for serogroup C (11.4%) than B disease (8.1%), a difference that although not statistically significant was evident in all age groups but under 1-year olds (Fig. 5). Case fatality was highest in the very young, decreasing among younger children and then increasing again among teenagers and with age thereafter (Fig. 5a). Case fatality was also high for Group Y disease (13.3%), although the CI (5.1%-26.8%) was wide due to the small number of cases (6 of 45 cases during

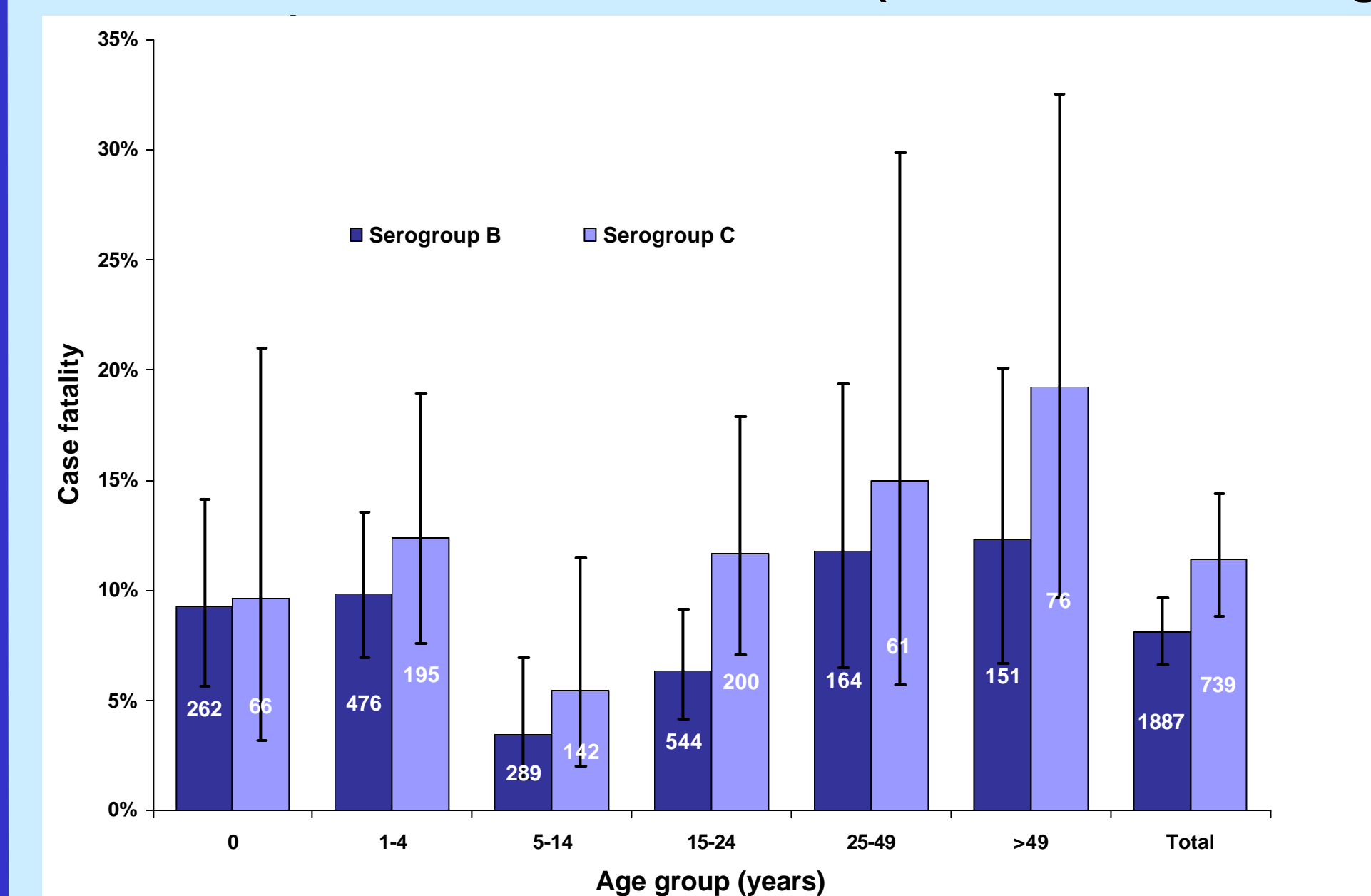


Fig. 5: Case fatality according to age, Serogroups B and C, Germany, 2001-2004.

Error bars depict 95% confidence intervals (CI). The total no. of estimated cases for each serogroup and age category is shown within the bars.

### Results of fine typing

The distribution of fine types according to age group in 2004 is shown in Fig. 6

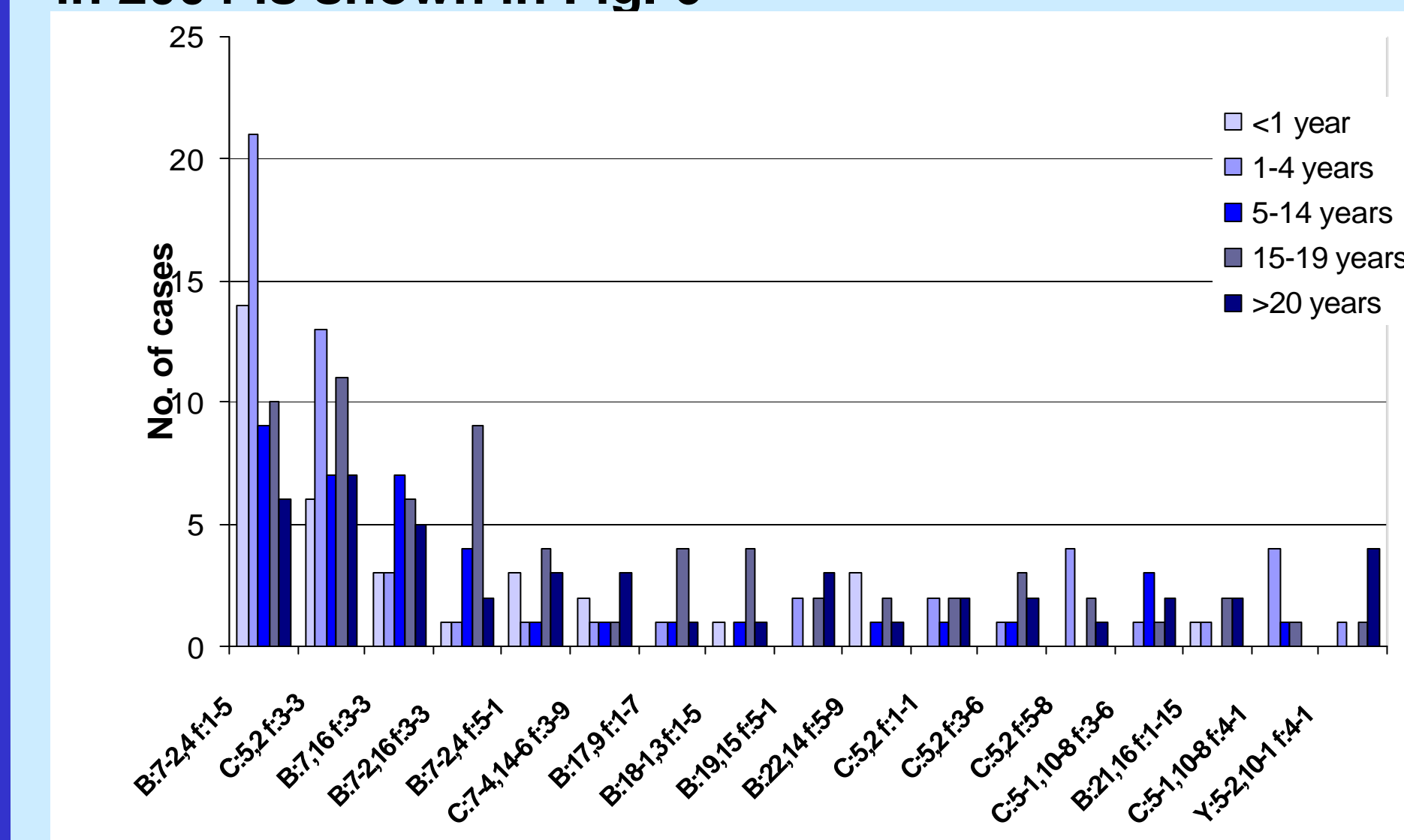


Fig. 6: Distribution of fine types according to age group, Germany, 2004.

The most common Serogroup B subtype, B:7-2,4 f:1-5, has been most frequently observed in Northrhine-Westphalia near the Dutch border (Fig. 7). Lineage 3 (ST41/44 complex) has been the most common subtype observed in the Netherlands during the past ~20 years, although its incidence has started to decrease in recent years. A collaboration with A. van der Ende has been established for comparison and geographic mapping of lineage 3 isolates in the Netherlands and Northrhine-Westphalia.

## Results, cont.

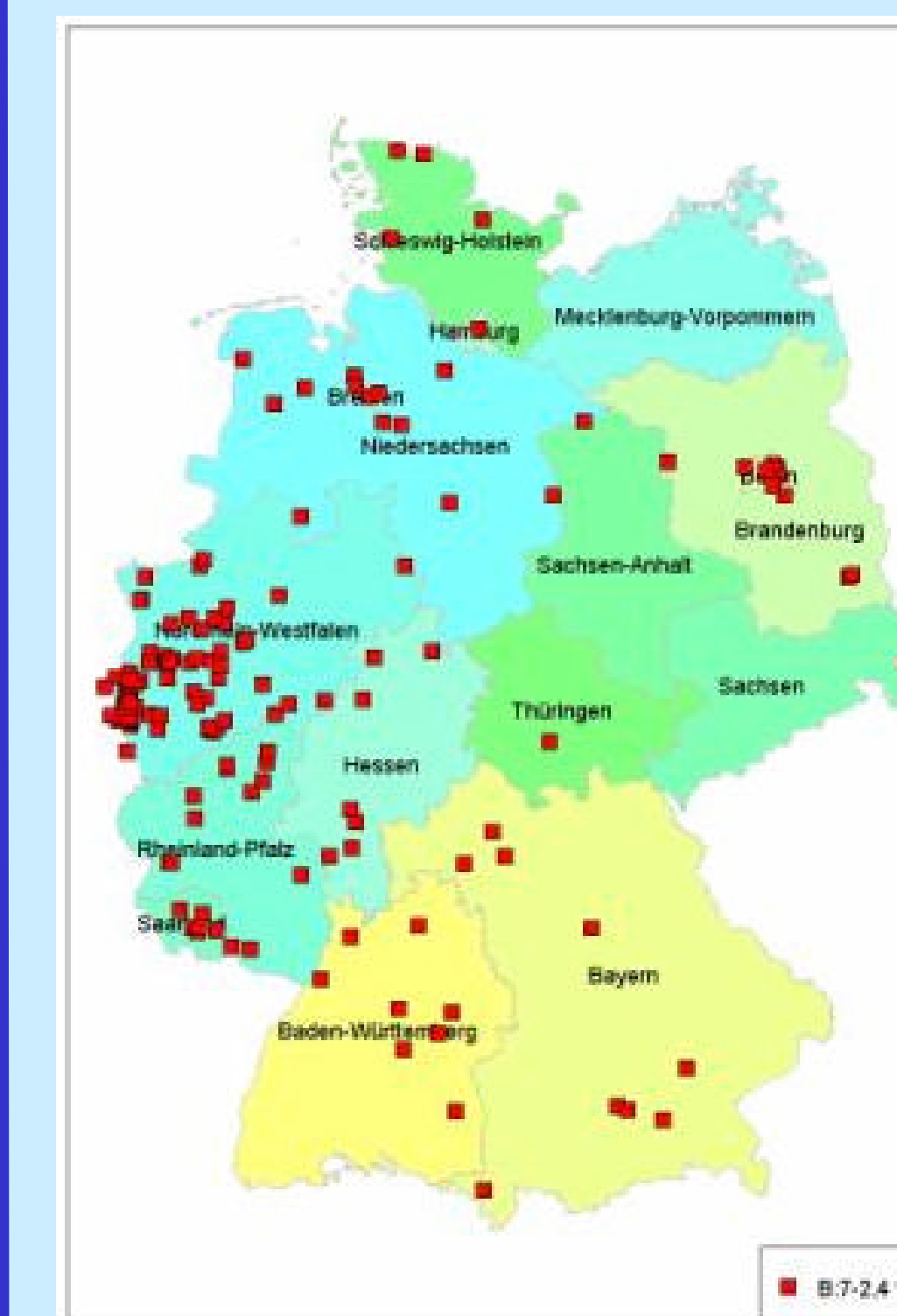


Fig. 7: Geographic distribution of the B:7-2,4 f:1-5 subtype, Germany, 2002-2004.

The most common Serogroup C subtype C:5-2 f:3-3 was not found to be clustered in any particular area.

Case accumulations and clusters identified by scan statistics making use of DNA sequence based fine typing were generally small in size and frequently caused by the ET-15 clone.

### Completeness of reporting and data quality

A capture-recapture analysis performed on data from 2003 revealed a sensitivity of 89.6% for the national reporting system and 64.8% for the NRZM. In 2004, data exchange between the NRZM and RKI was intensified and quality control measures were implemented to increase the proportion of completely reported data sets. Only 6.8% of cases are diagnosed using PCR. Increased use of PCR might increase diagnostic yield particularly among patients who may have received antibiotic treatment prior to diagnostic testing.

## Conclusions

IMD-incidence in Germany is low in international comparison at 0.7-0.9 cases/100,000 population, with a predominance of serogroup B disease. The incidence of serogroup C disease ranged between 0.19-0.26 cases/100.000 during 2001-2004; an estimated 84 of 739 Serogroup C cases that occurred during this period died. Currently, conjugate meningococcal group C vaccine is recommended only for risk groups.

Collaboration between the RKI and the NRZM has been intensified with regard to rapid exchange and harmonization of data. Improved data quality will allow rational responses to any changes in the epidemiology of meningococcal disease in Germany, especially with regard to possible vaccine implementation.