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## Persistent burden of invasive pneumococcal disease in adults in Germany

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**Background:** *Streptococcus pneumoniae* remains a leading cause of pneumonia, sepsis and meningitis and disproportionately affects young children and the elderly. In July 2006, vaccination with pneumococcal conjugate vaccine was generally recommended in Germany for all children ≤ 24 months. PCV13 was licenced for adults in 2011 and uptake in adults has increased since. In this study, we present the burden of disease and serotype distribution among adults with invasive pneumococcal disease (IPD) before and after the start of childhood and adult vaccination.

**Material/methods:** The GNRCS has monitored the epidemiology of IPD in adults in Germany since 1992. Cases of IPD in adults are reported by a laboratory-based surveillance system, including over 300 laboratories throughout Germany. The present analysis includes cases documented between 1992 and 2017. Species confirmation was done by optochin testing and bile solubility testing. All isolates were serotyped using the Neufeld Quellung reaction.

**Results:** From 2008 to 2014 the amount of IPD isolates sent to the GNRCS has remained stable (2000-2300 per year), but in the last two seasons an increase to 2500-2600 isolates has been observed. Before the introduction of childhood vaccination (1992-2006) the most prevalent serotypes among adults with IPD were 14, 3, 7F, 4, 23F, 1 and 9V. In the current season (2016-2017), serotypes 3, 8, 9N, 12F, 22F and 19A were most prevalent. Before childhood vaccination 40-45% of IPD cases among adults were caused by PCV7 serotypes. After the start of childhood vaccination this percentage was gradually reduced to 4.7% in July-November 2016.

In 2009, higher valent vaccines (PCV10 and PCV13) were introduced among children. Among adults, a reduction of the percentage of IPD caused by the six additional serotypes from 47.2% in 2010-2011 to 25.8% in 2015-2016 was observed. First data for the 2016-2017 season (July-November 2016) indicate a stabilization at 25.9%. The decrease is due to serotypes 1, 6A, 7F and 19A and could be

caused by herd- and direct effects in adults. IPD due to serotype 3 has strongly increased since higher-valent vaccine introduction, and is currently the most prevalent serotype, reaching 18.7% in the current season (July-November 2016).

Non-PCV13 serotypes have gained in importance since the start of childhood vaccination. Strongest increasing serotypes among IPD in adults are serotypes 10A, 12F, 15A and 23B. Of these, 15A and 23B shows the most significant trend and are often penicillin non-susceptible.

**Conclusions:** Although a herd protection effect of PCV7 and PCV13 was observed, the burden of IPD among German adults remains high, underlining the importance of individual vaccination. The herd effect is not the same for all serotypes and was not observed for serotype 3.