



## **Factsheet *Haemophilus influenzae* type b PIENTER 3 study results**

### **Background**

The bacterium *Haemophilus influenzae* serotype b (Hib) naturally occurs in the human respiratory tract (called asymptomatic carriage). Nowadays, Hib rarely causes severe disease, but disease occurred much more frequently before the introduction of Hib-vaccination. Young children are most at risk for severe Hib disease.

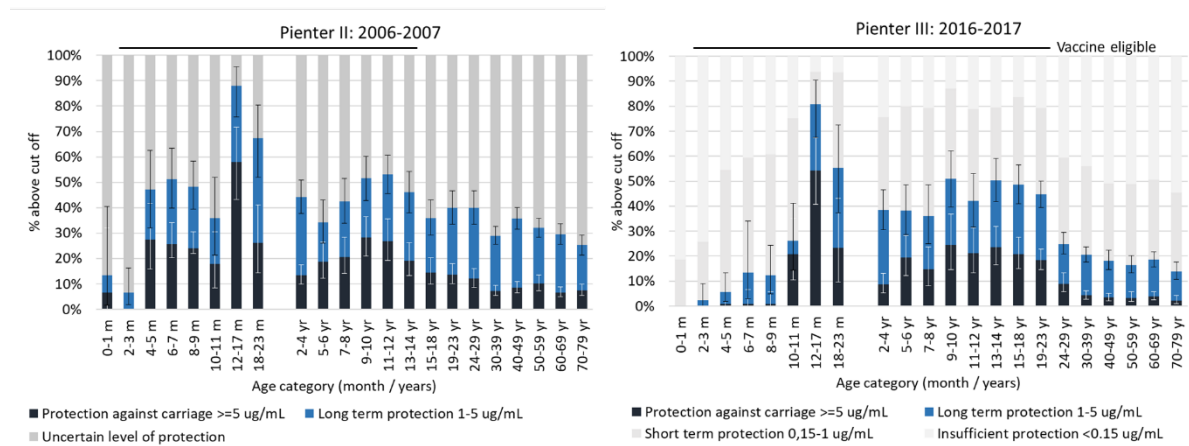
Vaccination against Hib disease is part of the national immunization programme (NIP) since 1993. Various vaccines have been used since then. At the time of PIENTER2 (2006/07) and PIENTER3 (2016/17), vaccinations were offered at 2, 3, 4 and 11 months of age. More than 90% of the children in the Netherlands have been vaccinated against Hib.

Hib disease has become more common in the last decade among children younger than five years. This might be due to decreased immunity against Hib disease, either because of less asymptomatic carriage leading to reduced natural immunity in the population and/or because of changes in the vaccine product used in the NIP. In this study, we investigated the proportion of people per age-group that had sufficiently high concentrations of antibodies to be protected against disease or carriage.

### **Preliminary results**

In both, PIENTER2 and PIENTER3, the proportion of persons with antibody concentrations indicating long term protection against disease or against carriage was highest for those aged 12-17 and 18-23 months (Figure 1). This peak reflects the response to the booster vaccination at 11 months. The lowest proportion with sufficiently high antibodies was found among new-borns. It is remarkable that the proportion of new-borns with sufficiently high antibodies was lower in PIENTER3 than in PIENTER2. Foetuses receive antibodies from their mother during pregnancy, and these maternal antibodies decrease in concentration during the first 6 months of live. The lower proportion of protected new-borns in PIENTER3 may indicate less transfer of maternal antibodies in utero. Indeed, the proportion of those in child-bearing age with sufficiently high concentrations of antibodies was lower in PIENTER3 compared with PIENTER2. In PIENTER3, only those below the age of 23 years were eligible for vaccination through the NIP.

Figure 1. Proportion of the population by age group with anti-Hib antibodies at the level that is assumed to give insufficient protection, short term protection against disease, long term protection against disease or protection against asymptomatic carriage of the bacterium in PIENTER2 (2006-2007) and PIENTER3 (2016-2017). Note that in the subfigure of PIENTER2, no distinction is made between insufficient protection and short term protection against disease; these levels are indicated as uncertain level of protection. The straight black horizontal line indicates which age groups were eligible to receive Hib vaccination in the national immunization programme.



The proportion of children with sufficiently high antibodies after the primary series in the NIP (i.e., vaccinations at 2, 3, 4 months) was also lower in PIENTER3 than in PIENTER2. The vaccine type offered within the NIP to children in these age-groups differed between PIENTER3 and PIENTER2.

### Conclusion/discussion

These preliminary results indicate that the proportion of infants (aged <10 months) with long term protection against Hib disease was lower in PIENTER3 (children born in 2015 to 2017) than in PIENTER2 (children born in 2005 to 2007). This was seen for new-borns and after the primary series of the NIP. The lower proportion of those in childbearing age with sufficiently high concentrations of antibodies might have led to less transmission of maternal antibodies to the foetuses. Furthermore, the change in the type of vaccine used in the NIP might have influenced this. However, it is not possible to distinguish such vaccine effect from other causes that may have caused the lower antibody concentrations, such as less natural immunity or other (unknown) causes. Overall, the population seemed less protected against Hib disease in 2016-2017 (i.e. PIENTER3) than ten years earlier, i.e. in 2006/2008 (PIENTER2).