Background

- In Germany, varicella vaccination was recommended for children >11 months in 2004 with one dose of monovalent or two doses of combined varicella vaccine (MMRV, available since August 2006). Since 2009 two doses are generally recommended.
- Sentinel-surveillance is in place since April 2005: About 650 physicians send monthly aggregated reports on number of varicella cases, administered 1st and 2nd doses of monovalent varicella or MMRV doses as well as case-based questionnaires for all vaccinated cases.
- We investigated the effect of the 2-dose recommendation on the number of vaccine doses administered and on breakthrough cases (BTC) after varicella vaccination by sentinel surveillance.

Results

1. Varicella Cases and BTC:
Varicella cases decreased by 80% from 3.6 to 0.7 NPM (fig.1).

Case-based reports included 2,753 and 209 cases of breakthrough varicella after one (BTC1) or two (BTC2) vaccine doses, respectively. The mean interval after vaccination was 29 (21) months for BTC1 (BTC2) and was increasing with longer observation period (table). BTC1 increased from 0.01 to 0.09 NPM in 2008 and dropped to 0.03 in 2011. First BTC2 appeared in 2007, growing to 0.01 NPM in 2011 (fig.1). The proportion of moderate/severe cases on all vaccinated cases with known number of lesions was 11% in both, BTC1 and BTC2.

2. Varicella vaccine doses (fig.2):
Monovalent first vaccine doses (Vmono1) increased from 7.4 to 9.8 NPM in 2004 and decreased to 1.2 in 2011. Monovalent second doses (Vmono2) increased from 0.2 to 5.1 NPM in 2009 and decreased to 3.0 NPM in 2011. MMRV first (second) doses steadily increased from 0.2 to 5.1 NPM in 2006 and decreased to 1.2 in 2011. Monovalent second doses (Vmono2) increased from 0.2 to 5.1 NPM in 2009 and decreased to 3.0 NPM in 2011. MMRV first (second) doses steadily increased from 5.3 (2.8) NPM in 2007 to 7.0 (6.0) NPM in 2011. Since 2009, the number of second doses exceeded the number of first doses.

3. BTC per 1000 vaccine doses (fig.3):
BTC after 1st doses have decreased from 16 BTC1 per 1000 first vaccine doses to less than 1/1000 doses. The decrease was greatest for BTC1 after monovalent 1st doses. BTC2 per 1000 second doses were increasing but less frequent than BTC1 per 1000 first doses till 2008. Since 2009, BTC1 and BTC2 occur in the same extent. BTC2 per 2nd MMRV-doses were slightly higher than per 2nd monovalent doses.

Methods

- The annual number of cases and administered vaccine doses were calculated as mean number per sentinel-physician and per month (NPM).
- BTC1 (BTC2) was defined as clinical varicella >=42 days after first (second) vaccination.
- Severity was defined by number of lesions <50 (mild disease) and >=50 (moderate/severe disease).
- The number of BTC1 (BTC2) was divided by the total number of 1st (2nd) varicella vaccine doses administered by sentinel practices in the same month as 1st (2nd) vaccination of the case. With data on administered vaccines in BTC available since April 2007, further differentiation was possible by monovalent vaccines and MMRV.

Conclusion:

- Varicella vaccination in Germany led to a substantial decrease of varicella cases.
- Sentinel practices prefer vaccines for 1st and 2nd varicella vaccine doses according to vaccine availability and recommendations.
- With a 2-dose schedule, breakthrough cases of varicella can be diminished but not avoided.
- Disease severity seems not to differ between breakthrough cases after one or two doses.
- A longer observation period is needed to define the extent of breakthrough disease after two doses.