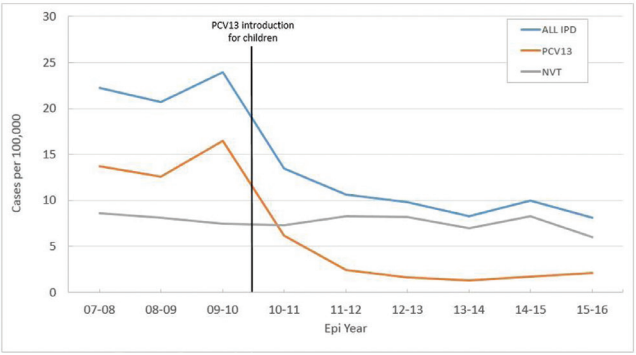
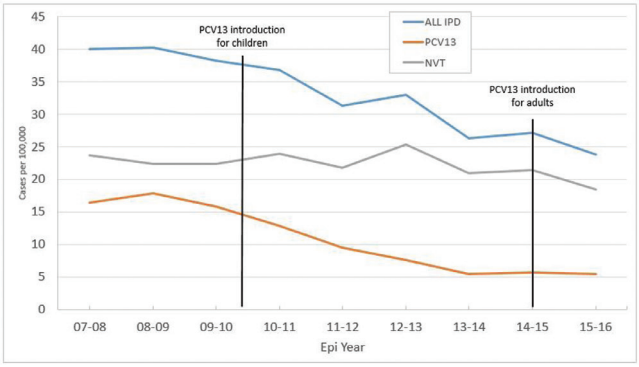
IPD rates among children < 5 years old, July 2007 - June 2016



IPD rates among adults ≥65 years old, July 2007 - June 2016



Disclosures. **W. Schaffner**, Pfizer: Scientific Advisor, Consulting fee; Merck: Scientific Advisor, Consulting fee; Novavax: Consultant, Consulting fee; Dynavax: Consultant, Consulting fee; Sanofi-pasteur: Consultant, Consulting fee; GSK: Consultant, Consulting fee; Seqirus: Consultant, Consulting fee; **L. Harrison**, GSK: Scientific Advisor, Consulting fee

2493. Invasive Pneumococcal Disease in Massachusetts Children 6 Years Following Introduction of PCV13

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Background. A second generation 13-valent-pneumococcal conjugate vaccine (PCV13) replaced PCV7 in the childhood immunization schedule in Massachusetts (MA) beginning in April,2010

Methods. Cases of invasive pneumococcal disease (IPD) in children <18 years of age were detected through an enhanced surveillance system in MA since 2001. All cases in children and *Streptococcus pneumoniae* (SP) isolates, when available, are submitted to Department of Public Health (MDPH) and parents/physicians are interviewed for confirmation of demographic and clinical data. All available isolates are confirmed as SP, serotyped by Quellung reaction

Results. Three-hundred-thirty-seven IPD cases have been identified in MA children between 4.January 4, 2010 and 03.31.2017(Figure). Thirty-five(10.4%) were in infants <6 months; 41(12.2%) in children between 6 and 12 months; 60 (17.8%) in toddlers 12 to 24 months; 100 (29.7%) in children between 2 and 5 years of age and 101 (29.9%) were in children >5 years old. Among children under 2; incidence of IPD declined to $6.8/10^5$ children (95% CI 2.6–11.1) in 2015/16 period which represents a 72.1% decline compared with 2010/11; however in 2016/17 IPD incidence increased by 41.2% to $9.6/10^5$ (95% CI 4.6–14.6) for the first time since the implementation of PCV13.Bacteremia was the most common clinical presentation (62.9%) followed by pneumonia(30.5%) and CNS disease(6.6%). Children with at least one comorbidity were an increasing proportion of cases reaching 37.9% in 2016 (p 0.004). The overall mortality rate was 4.3%. Isolates from 301 (90.1%) were available for serotyping; vaccine serotypes (VST) were identified in 101 (33.6%) cases [serotype 19A(49 cases), 7F(21 cases), 3(18 cases), 19F (7cases), 6A(3 cases), serotypes 14, 18C and 5(1 case each)]. The proportion of VST disease declined to 24.1% from 59.2% over 6 years after PCV13 ($p < 0.001$). Serotypes 15BC (13.5%), 33F (12.5%) and 22F (12.5%) were the most common nonvaccine serotypes (NVST).

Conclusion. In the post-PCV13-era, IPD is primarily due to NVSTs and disproportionately observed in children with comorbid conditions. In the most recent year (4.1.2016 through 3.31.2017) an increase in incidence was observed in MA children after six years of declining cases following implementation of PCV13.

Disclosures. **S. I. Pelton**, Pfizer: Board Member and Grant Investigator, Consulting fee, Research grant and Speaker honorarium; Merck vaccines: Board Member, Consulting fee and Speaker honorarium; GSK: Board Member, Consulting fee and Speaker honorarium; Sequiris: Board Member, Consulting fee and Speaker honorarium

2494. Analysis of Invasive Pneumococcal Infections Due to 13-Pneumococcal Conjugate Vaccine Serotypes at 8 US Children's Hospitals During 2014 to 2016

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Background. The 13-Valent Pneumococcal Conjugate Vaccine (PCV13) was licensed in 2010 and is directed against serotypes (ST) 1,3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F. Details of cases of invasive pneumococcal disease (IPD) due to PCV13 ST since 2010 in the US are sparse. We describe IPD cases due to PCV13 ST seen at 8 US children's hospitals over years 2014 to 2016 which may aid in understanding why some IPD cases due to these ST have persisted.

Methods. Children with IPD have been prospectively identified at 8 children's hospitals in the US since 1993. Data from 2014 through 2016 were analyzed. Demographic, clinical data and number and dates of PCV doses were collected on case report forms and isolates were sent to a central laboratory for serotyping. PCV doses are counted if IPD occurred > 2 weeks after a dose.

Results. PCV13 ST accounted for 19.7% (27/137), 26.8% (30/112) and 26% (33/127) of IPD cases in 2014, 2015 and 2016, respectively. ST 3, 19A and 19F accounted for 90% of the PCV13 ST IPD cases. >50% of the children had received ≤2 doses of PCV13 prior to IPD. (Table) Of the 30 children with 0 doses of PCV, 15 were of an age at diagnosis for which ≥ 2 doses of PCV was recommended. An underlying condition was noted in 18. For PCV13 ST, the types of IPD were pneumonia ($n = 39$), mastoiditis ($n = 15$), bacteremia ($n = 15$), meningitis ($n = 12$) and other sites of infection ($n = 9$). Whereas the numbers of yearly cases were similar for ST3 (12, 10, 13) and ST19A (8, 10, 6), the numbers for 19F increased slightly (3, 8, 10).

Conclusion. Four to 6 years after PCV13 was introduced, PCV13 ST (especially ST 3, 19A and 19F) accounted for about 25% of IPD in children. For all of the PCV13 ST, over half of these IPD cases occurred in children who had received ≤ 2 doses of the recommended PCV schedule; 25% of cases occurred in children who had not received any doses but were of the age at diagnosis that at least 2 PCV doses should have been received. Additional PCV13 ST IPD cases may be preventable if the PCV13 schedule is followed as recommended.

Disclosures. **S. L. Kaplan**, Pfizer: Grant Investigator and Speaker at PCV13 Launch Meeting in China, Research grant and Speaker honorarium; **J. S. Bradley**, Merck & Co., Inc.: Investigator, Research support

PCV13 Doses Prior to IPD[a]

ST	0	1	2	3	4	Total Cases	Median age
3	8	5	3 (0)	8	10 (1)	34	54 months
19A	12 (5)[b]	1 (1)	2	2	7 (2)	24	25 months
19F	4	3 (2)	1	5 (1)	8 (2)	21	43 months
7F	4 (1)	0	0	0	0	4	
14	1	0	0	0	1 (1)	2	
18C	1	0	0	0	0	1	
23F	0	0	0	1 (1)	1 (1)	2	
Total	30	9	6	16	27	88	

[a]PCV7 doses were included for ST 14, 18C, 19F, and 23F; PCV status of 2 patients was unknown.
[b]number with underlying condition in ().

2495. Changes in Pneumonia Incidence and Infant Mortality 5 Years Following Introduction of the 13-valent Pneumococcal Conjugate Vaccine in a "3+0" Schedule in Nicaragua

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Background. *Streptococcus pneumoniae* causes an estimated 826,000 deaths of children in the world each year and many health facility visits. To reduce the burden of pneumococcal disease, many nations have added pneumococcal conjugate vaccines to their national immunization schedules. Nicaragua was the first country eligible for funding from the GAVI Alliance to introduce the 13-valent pneumococcal conjugate vaccine (PCV13), provided to infants at 2, 4, and 6 months of age. The goal of this study was to evaluate the population impact of the first five years of the program.

Methods. Numbers of visits for pneumonia, pneumonia-related deaths, bacterial meningitis, and infant deaths between 2008 and 2015 were collected from all 107 public health facilities in León Department. Vital statistics data provided additional counts of pneumonia-related deaths that occurred outside health facilities. Adjusted incidence rates and incidence rate ratios (IRRa) in the vaccine (2011–2015) and pre-vaccine periods (2008–2010) were estimated using official population estimates as exposure time.

Results. The IRRa for pneumonia hospitalizations was 0.70 (95% confidence interval [CI]: 0.66, 0.75) for infants, and 0.92 (95% CI: 0.85, 0.99) for one year olds. The IRRa for post-neonatal infant mortality was 0.56 (95% CI: 0.41, 0.77). In the population as a whole, ambulatory visits and hospitalizations for pneumonia, as well as pneumonia-related mortality and rates of bacterial meningitis were lower in the vaccine period.

Conclusion. Five years following program introduction, reductions were observed in health facility visits for pneumonia in immunized age groups and infant mortality, which would be hard to achieve with any other single public health intervention. Future study is warranted to understand whether the lack of a booster dose (e.g.,, at 12 months) may be responsible for the small reductions in pneumonia hospitalizations observed in one year-olds as compared with infants.

Disclosures. **S. Becker-Dreps**, Pfizer: Consultant and Grant Investigator, Consulting fee and Research grant; **D. J. Weber**, Pfizer: Consultant and Speaker's Bureau, Consulting fee and Speaker honorarium

2496. A population-based Study of Recurrent Symptomatic *Bordetella pertussis* Infections in Children in California, 2010–2015

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Background. Natural infection with *Bordetella pertussis* is thought to result in 4–20 years of immunity against subsequent symptomatic pertussis infection. However, these estimates are based on studies in unvaccinated or whole-cell vaccinated children. We conducted a population-based study of pertussis infection and reinfection during a 5-year period in California in an exclusively acellular-pertussis vaccinated cohort.

Methods. California surveillance data were reviewed to identify all children with two reported incidents of pertussis with symptom onset from January 1, 2010 through December 31, 2015. Case investigation reports were reviewed and children with at least two episodes of symptomatic pertussis infection that met the case definition were included.

Results. Of 26,259 pertussis cases reported in children <18 years, 27 children met the inclusion criteria. Recurrent cases occurred among children of all ages, and the median age for the first and second pertussis episodes were 3.5 years (range, 1.3 months-14 years) and 6.5 years (range, 5.2 months–16.3 years) respectively. The median duration of time between initial infection and reinfection was 1.3 years (range, 2.9 months–4.4 years). Twenty-one children (78%) had received ≥3 doses of DTaP vaccine at the time of their first pertussis infection, 1 (4%) had received 1 dose, and 5 (19%) were unvaccinated.

Conclusion. Recurrent cases of pertussis infection are very rare. Contrary to previous reports that natural infection with *B. pertussis* results in 4–20 years of sterilizing immunity, we demonstrate that symptomatic reinfection with pertussis can occur as soon as 89 days following the first infection. More research is needed to understand the immune response to *B. pertussis* infection in children vaccinated with acellular-pertussis vaccines.

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2497. Effectiveness of Prenatal Tdap Immunization in the Prevention of Infant Pertussis in the United States

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Background. The Centers for Disease Control and Prevention recommends that all pregnant women in the United States receive tetanus-diphtheria-acellular pertussis (Tdap) immunization to prevent infant pertussis. While the vaccine may be administered at any time during pregnancy, the recommendations define administration at 27 to 36 weeks of gestation as optimal timing to prevent infant pertussis. These recommendations were primarily based on immunogenicity studies. The objective of this study was to examine the clinical effectiveness of prenatal Tdap, and to understand whether effectiveness varies by gestational age at immunization.

Methods. We performed a nationwide cohort study of pregnant women with deliveries in 2010–2014 and their infants. Commercial insurance claims data were used to identify receipt of Tdap immunization in the pregnant women, and hospitalizations and outpatient visits for pertussis in their infants until 18 months of age. To address the difficulties in diagnosing pertussis, we also employed a "probable pertussis" definition, as an inpatient or outpatient diagnosis of pertussis, plus antibiotic treatment with a macrolide or trimethoprim/sulfamethoxazole within 7 days of diagnosis. Pertussis occurrence was compared between infants of mothers who received prenatal Tdap (overall, and stratified by gestational age at administration) and infants of unvaccinated mothers.

Results. There were 675,167 mother–infant pairs included in the cohort. Among infants whose mothers received Tdap at any time during pregnancy, the rate of pertussis hospitalization was 50% lower (adjusted hazards ratio (HR) = 0.50, 95% CI: 0.23, 1.09), and the rate of probable pertussis was 42% lower (HR = 0.58, 95% CI: 0.38, 0.89) than infants of unimmunized mothers. Pertussis rates were also lower for infants whose mothers received prenatal Tdap during the third trimester. Infants whose mothers received Tdap before the third trimester also tended to have lower rates of pertussis, but these estimates were imprecise.

Conclusion. Infants of mothers who received prenatal Tdap experienced half the rate of pertussis as compared with infants of unimmunized mothers. Our results do not provide evidence to support changing the currently recommended timing of Tdap administration in pregnancy.

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2498. Cervical Adenocarcinoma in Situ in the United States: Results from Population-based Laboratory Surveillance, 2008–2014

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Background. Cervical cancer screening methods are more effective for detection of squamous cell carcinoma precursor lesions (cervical intraepithelial neoplasia; CIN2 and 3) than for less-common adenocarcinoma precursors (adenocarcinoma in situ; AIS). Primary prevention through human papillomavirus (HPV) vaccination is expected to impact both CIN and AIS, although less data exist about the HPV types associated with AIS. We analyzed HPV types detected in AIS and CIN identified through population-based surveillance.

Methods. The Centers for Disease Control and Prevention and partners conduct surveillance for CIN2, CIN3, and AIS (CIN2+) among women aged ≥18 years in five locations in the United States. Specimen blocks for women aged 18–39 are sent to CDC for HPV typing using L1 consensus PCR. We analyzed cases with AIS only, AIS with CIN2 or 3 (AIS+CIN), and CIN3 only, the highest grade squamous cell precursor. We used chi-square tests to compare HPV types by histology. Types evaluated were HPV16 and 18 (high-risk (HR) types targeted by all HPV vaccines), 5 additional HR types targeted by the 9-valent vaccine (31/33/45/52/58; "additional 9vHPV"), and 7 other HR non-vaccine types (35/39/51/56/59/66/68).

Results. Between 2008 and 2014, 18,394 women were diagnosed with CIN2+. Of those, 517 (2.8%) had AIS (283 AIS only, 234 AIS+CIN) and 5,766 (31%) had CIN3