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Background: *Streptococcus pneumoniae* can colonizes the human nasopharynx, and can cause life-threatening infections like community-acquired pneumonia (CAP) and invasive pneumococcal diseases (IPD). In Canada, the 13-valent conjugate vaccine (PCV13) was introduced in childhood immunization since 2010, with hopes that it would not only protect the vaccinated, but also confer indirect protection to adults through herd immunity. Given data on *S. pneumoniae* nasopharyngeal (NP) carriage in adults is scarce, this study reports on *S. pneumoniae*-positivity and serotype distribution in adult carriage from years 2010 to 2017.

Methods: Active surveillance was performed in adults hospitalized with for CAP or IPD from December 2010 to 2017. For assessment of *S. pneumoniae* carriage, NP swabs were tested using *lytA* and *cpsA* real-time PCR. *S. pneumoniae*-positive NPs were subjected to serotyping using conventional and real-time multiplex PCRs.

Results: Overall, 6472 NP swabs were tested, and Spn was identified in 366 (5.7%). Of the 366 *S. pneumoniae*-positive NP swabs, a serotype was assigned in 355 (97.0%). From years 2010 to 2017, the proportion of *S. pneumoniae*-positive NP swabs declined from 8.9% to 4.3%. This was also reflected in the proportion of serotypeable results attributed to PCV13 serotypes, which also declined from 76.9% to 42.2%. The decline was primarily attributed to PCV13 serotypes 7F and 19A. PCV13 serotype 3 remained predominant throughout the study, as did non-PCV13 serotypes like 22F, 33F, and 11A. On the other hand, a proportional rise over time was noted for non-vaccine serotypes (from 15.4% to 31.1%). This was primarily attributed to serotypes 23A, 15A, and 35B.

Conclusion: Monitoring serotype trends is important to assess the impact of pneumococcal vaccines. While herd immunity from PCV13 childhood immunization was anticipated, few studies have assessed its impact on adult carriage. This study described Spn serotype distribution in adults over years 2010 to 2017, demonstrating not only a reduction of PCV13 serotypes over time, but a proportional rise in non-vaccine serotypes. These emerging serotypes may represent the emergence of serotype replacement. Ongoing serotype surveillance will be needed to compare *S. pneumoniae* carriage to serotypes associated with pneumococcal CAP and IPD.

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2715. Pneumococcal Community-Acquired Pneumonia Attributed to PCV13 Serotypes in Hospitalized Adults: Comparison of the 50–64 and 65+ Age Groups

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Background: In healthy adults aged ≥65 years, direct immunization with the 13-valent pneumococcal conjugate vaccine (PCV13) was shown effective at preventing vaccine-type pneumococcal community-acquired pneumonia (pCAP) and invasive pneumococcal disease (IPD). Although PCV13 was licensed for use in Canadian adults aged >50 years, it was recommended for immunocompromised individuals who are at highest risk of IPD. In 2016, a recommendation was issued for use of PCV13 in immunocompetent adults aged ≥65 years, for the prevention of pCAP and IPD. This study aimed to compare pCAP cases attributed to PCV13 serotypes in adults aged 50–64 and ≥65 years.

Methods: Active surveillance for CAP and IPD was performed from 2010 to 2015 in adult hospitals across five Canadian provinces. To identify pCAP, blood culture, sputum culture, or a PCV13 serotype-specific urine antigen detection (ssUAD) were used. Serotype was assigned using Quellung reaction, PCR, or ssUAD. All pCAP cases were categorized by serotype and age groups. Patient demographics and outcome data were collected.

Results: Over years 2010–2015, 6687 CAP cases were tested. 835 pCAP cases were identified, of which 418 (50%) caused by a PCV13 serotype. The majority (74%) of PCV13-associated pCAP occurred in the adults aged ≥50 years, whereas only 41.4% (173/418) were in adults ≥65 years. PCV13 pCAP cases declined over the years, likely through herd immunity from childhood immunization. The yearly proportion of pCAP attributed to PCV13 serotypes for ages ≥50 remained high (67.5 to 80.6%), compared those occurring in the ≥65 age groups (35.1 to 49.4%). Compared with test-negative controls, pCAP cases in both age groups were more likely to be admitted to ICU, require mechanical ventilation, and had higher mortality. Of pCAP deaths, 61.4% and 82.3% were in the ≥65 and ≥50 age cohorts, respectively.

Conclusion: From year 2010 to 2015, adults hospitalized with PCV13 pCAP in the ≥65 age cohort accounted for less than half of the cases, whereas including the 50–64 age cohort increased the proportion to 74%. Similarly, the proportion of PCV13 pCAP deaths that occurred in adults aged ≥50 years was 82%, compared with 61% in the ≥65 age cohort. Expansion of PCV13 recommendations to include adults 50–64 years of age should be considered.

Disclosures. **All authors:** No reported disclosures.

2716. Persistence of 13-Valent Pneumococcal Conjugate Vaccine (PCV13) Serotypes in Invasive Pneumococcal Disease in Adults in Southern Ontario Canada Despite Routine Pediatric Vaccination

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Background: In Ontario, Canada, PCV13 is covered for immunocompromised (IC) adults over 50y. PCV13 programs are thought not to be cost-effective in other adults because it is assumed that herd immunity from pediatric vaccination programs (PCV7 since 2005; PCV13 since 2010) will reduce PCV13 disease burden dramatically in adults. We analyzed data from the Toronto Invasive Bacterial Diseases Network (TIBDN) to ask whether PCV13-type invasive pneumococcal disease (IPD) in adults persists in our population.

Methods: TIBDN performs population-based surveillance for IPD in Toronto+Peel Region, Ontario (pop4.1M). All microbiology laboratories receiving specimens from residents report cases of IPD and submit isolates to a central study lab for serotyping; annual audits are conducted. Demographic, medical and vaccination information are obtained from patients, families and physicians. Population data are from Statistics Canada.

Results: Since 1995, 10,365 episodes of IPD have been identified; detailed medical information was available for 9,801 (95%) and serotyping for 9411 (91%). Among 8658 adult cases, 4,273 (49%) were in those aged 15–64 years, and 4,285 (51%) in those aged >645 years. The most common diagnoses were pneumonia (5,978/8,025, 74%) and bacteremia without focus (1,030, 13%); 470 (4.6%) cases had meningitis; the case fatality rate (CFR) was 21%. The incidence of disease due to STs in PCV13 in adults declined from 7.0/100,000/year 2001 to 2.9/100,000/year in 2015–2018 and was stable from 2015–2018 (Figure 1). The incidence was > 5/100,000/year in non-IC patients over 65 years, and younger patients with cancer and kidney disease (Figure 2). In IPD from 2015 to 2018, adult patients with PCV13 ST disease were younger (median age 64 years vs. 67 years, P = .03) than other patients; there was no significant difference in the proportion with at least one underlying chronic condition (253, 69% PCV13ST, vs. 541,74% other ST, $P = 0.08$), or in CFR (59, 16% PCV13 vs. 145, 20% other, $P = 0.13$). The ST distribution of cases due to PCV13 STs is shown in Figure 3.

Conclusion: A significant burden of IPD due to PCV13 serotypes persists in adults in our population despite 8 years of routine pediatric PCV13 vaccination. This burden needs to be considered in assessing the value and cost-effectiveness of PCV programs for adults.

Figure 2 : Average annual incidence of IPD due to PCV13, 2013-2017

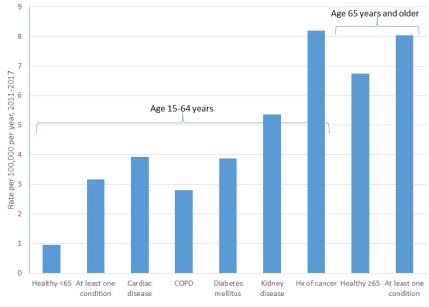


Figure 1: Incidence of PCV13-serotype disease by age-group,2013-2018, TIBDN

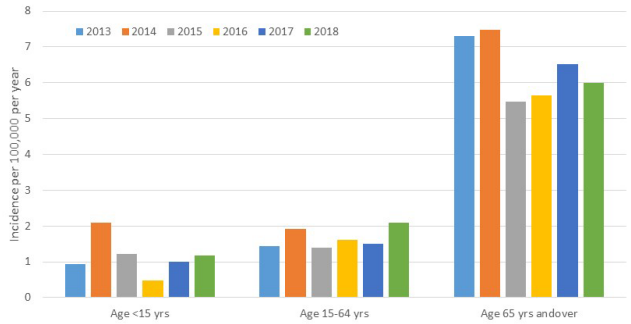
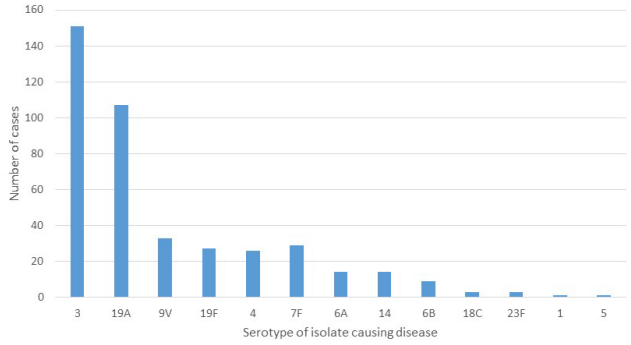


Figure 3: Distribution of PCV13 Serotype IPD in adults, TIBDN, 2015-2018



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2717. The Impact of Pneumococcal Conjugate Vaccine in Nonbacteremic Pneumococcal Pneumonia Among Cancer Patients

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Background: Invasive pneumococcal disease (IPD) and non-bacteremic pneumococcal pneumonia (NB-PNA) are associated with substantial morbidity and mortality in cancer patients. IPD incidence among cancer patients at MSKCC sharply declined after the introduction of routine childhood immunization with the 7-valent pneumococcal conjugate vaccine (PCV7) (1). An indirect effect of PCV on pneumococcal pneumonia incidence has also been reported (2, 3). The impact of PCV on the incidence of NB-PNA in patients with cancer has not been well studied.

Methods: Retrospective review of patients treated at MSKCC, 1993–2012. Unique patient visits (UPV) per year were defined as ≥1 inpatient or outpatient encounter within one calendar year. NB-PNA was defined as Isolation of *Streptococcus pneumoniae* from sputum or bronchoalveolar lavage (BAL); with associated symptoms (cough, sputum production, and/or fever) and radiographic findings compatible with pneumonia on chest radiograph or computerized chest tomography. NB-PNA incidence was calculated as number of NB-PNA cases per 1000 UPV. Three-time periods were examined: "before PCV7" (1993–2000), "after PCV7" (2001–2010), "after PCV13" (2011–2012).

Results: Of 323 NB-PNA cases, *S. pneumoniae* was isolated from BAL in 64 (20%) and sputum in 259 (80%). 182 (56%), 121 (37%), and 20 (7%) NB-PNA cases occurred "before PCV7," "after PCV7," and "after PCV13," respectively. The incidence of NB-PNA was highest in patients with hematologic malignancies and in patients ≥65 years during all three periods (Table 1). NB-PNA incidence was lower "after PCV7" compared with "before PCV7" (0.47 vs. 0.13, $P < 0.001$). A non-statistically significant lower incidence of NB-PNA was noted "after PCV13" vs. "after PCV7" (0.13 vs. 0.09, $P = 0.19$). The highest decline of NB-PNA after PCV7 introduction was observed in patients ≥65 years (0.67 vs. 0.16, $P < 0.001$).

Conclusion: (1) The incidence of NB-PNA in adult cancer patient declined after PCV7 compared with before PCV7. (2) The reduction in NB-PNA was highest in patients ≥65 years suggesting an indirect effect from PCV7 childhood immunization. (3) A trend toward decreased incidence in NB-PNA was noted after PCV13; further surveillance is required to ascertain this trend.

Table 1. trends in the incidence of Non-bacteremic pneumococcal pneumonia "before PCV7," "after PCV7" and "after PCV13"

	"Before PCV7" (1993-2000)		"After PCV7" (2001-2010)		Change in incidence from "before PCV7" to "after PCV7"	"After PCV13"		Change in incidence from "after PCV7" to "after PCV13"
	NB-PNA cases n = 182	NB-PNA incidence	NB-PNA cases n = 106	NB-PNA incidence	% change, (95% CI, P value)	NB-PNA cases n = 20	NB-PNA incidence	% change, (95% CI, P value)
Age (years)								
1-4	0	0.00	1	0.30	N/A	0	0.00	N/A
5-14	4	0.77	2	0.22	-71 (0.05-1.57, 0.20)	0	0.00	N/A
15-64	92	0.37	61	0.11	-71 (0.21-0.40, <0.001)	9	0.07	-35 (0.76-3.10, 0.22)
≥65	86	0.67	57	0.16	-76 (0.18-0.34, <0.001)	11	0.14	-14 (0.61-2.23, 0.64)
Cancer type								
Hematologic malignancies	36	1.37	23	0.41	-70 (0.18-0.50, <0.001)	4	0.25	-39 (0.57-4.77, 0.35)
Solid tumors	125	0.58	83	0.17	-70 (0.23-0.39, <0.001)	16	0.12	-29 (0.82-2.40, 0.21)
No cancer	21	0.15	15	0.04	-74 (0.13-0.51, <0.001)	0	0	N/A

Incidence is the number of NB-PNA cases per 1,000 UPV (unique patient visits).

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2718. Effectiveness of 13-Valent Pneumococcal Conjugate Vaccine in US Adults Hospitalized with Pneumonia, 2014–2017

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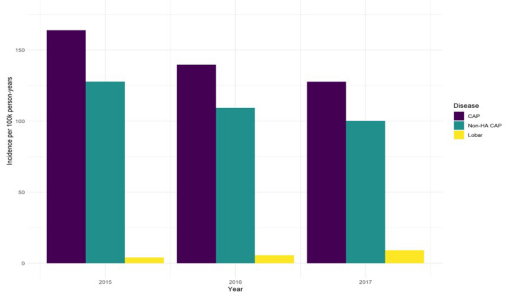
Background: Efficacy of 13-valent pneumococcal conjugate vaccine (PCV13) against pneumococcal pneumonia in adults aged >65 years was shown in a 2014 clinical trial. However, its benefits in countries with a mature PCV infant program remain unclear. In August 2014, PCV13 was recommended for all US adults aged >65 years. We evaluated the direct effect of this recommendation on pneumonia hospitalizations among the elderly.

Methods: We analyzed claims data from US Medicare beneficiaries aged >65 years enrolled in part A/B during September 1, 2014 through December 31, 2017. Participants were followed until they died, left part A/B, or developed a study outcome: community-acquired pneumonia (CAP), non-healthcare-associated CAP (non-HA CAP) or lobar pneumonia (LP). We identified outcomes using inpatient diagnosis codes, and vaccination status using procedure codes. We used discrete-time survival models, stratified by influenza season (October–April) and influenza vaccination status, to estimate incidence rate ratios (IRR) by pneumococcal vaccination status (PCV13-only vs. no pneumococcal vaccination). We adjusted for demographic factors, healthcare utilization, month/year of hospital discharge, and underlying conditions. We derived vaccine effectiveness (VE) and number of hospitalizations averted by PCV13 from the IRRs.

Results: Of 26.6 million beneficiaries in September 2014, 43.4% were male, 54.2% were aged 65–74 years, and 28.9% had a Charlson comorbidity score >3. PCV13 coverage increased from 0.8% in September 2014 to 41.5% in December 2017. Annual incidence of CAP, non-HA CAP, and LP are shown in the figure. PCV13-vaccinated persons were more likely to be older, sicker, and have received flu vaccine than unvaccinated persons. VE estimates for CAP, non-HA CAP, and LP ranged from 6.0–11.4%, 5.0–11.0%, and 1.3–11.0%, respectively. From September 2014 to December 2017, an estimated 28,600 (95% CI: 21,000–36,000) CAP, 18,700 (12,000–25,800) non-HA CAP and 1,100 (190–1,900) LP hospitalizations were averted.

Conclusion: Within 40 months after implementation of the adult PCV13 program, 2.0% (28,600) of US CAP hospitalizations were averted. Despite PCV13 effectiveness against adult CAP, only a small fraction of CAP hospitalizations was prevented.

Figure: Annual Incidence of CAP, non-HA CAP, and Lobar Pneumonia per 100,000 person-years



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