

Background

Pneumonia is a leading cause of hospitalization and mortality globally.¹⁻³ Following 13-valent pneumococcal conjugate vaccine (PCV13) vaccine introduction, studies have reported a decline in all-cause pneumonia hospitalizations in children,^{4,6} but the data varies for adults.⁷⁻⁸

Objective

We determined the impact of the childhood PCV13 immunization program on all-cause pneumonia hospitalization rates eight years after the vaccine was introduced in British Columbia, Canada.

Methods

Study Design: Retrospective cohort study

Timeline: 2000 to 2018

Data Sources: Administrative databases, such as, hospitalization, census, registry and demographics for the years 2000-2018 were linked using an anonymous study ID to build the cohort.

Cohort: Pneumonia hospital admissions, per month, were identified using the *International Classification of Diseases 10* codes: J12-J18. Both the primary and secondary codes were used.

Statistical Analyses: Changes in all-cause pneumonia hospitalization incidence rates before and after the PCV13 vaccine introduction, which was in Sept 2010, was evaluated using negative binomial regression and time-series modelling. The model was adjusted for seasonality, influenza-like-illness (ILI), introduction of PCV7 vaccine in 2003 and pre-PCV13 vaccine secular trends. Overall and age-specific rates are presented. Data cleaning was performed in SAS (v9.4) and analyses were conducted in R (v4.0.2).

Long term impact of the 13-valent pneumococcal conjugate vaccine use in infant immunization program on all-cause pneumonia hospitalizations in British Columbia, Canada: a time series analysis

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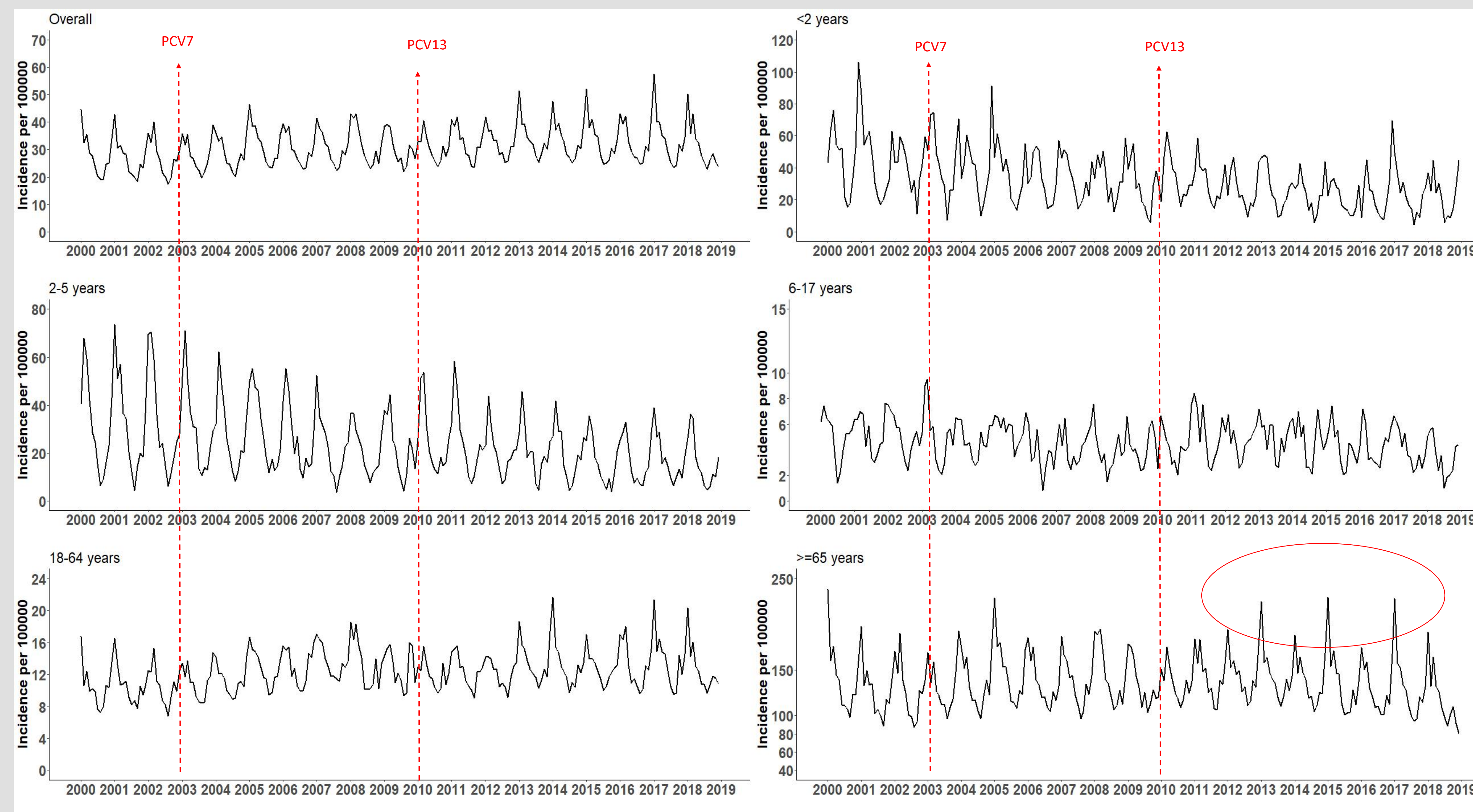
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Results

- As shown in Figure 1, no significant changes were noted at the population level, but significant reductions in all-cause pneumonia were observed in all the age-specific categories for children. The incidence rate ratios (IRR) ranged from 0.63 to 0.82 (Table 1).
- In contrast, a small significant increase was seen in those aged 65 years and above (Figure 1), with the IRR=1.05 (Table 1).

Figure 1: Annual hospital admissions for all ages and by age groups from all-cause pneumonia in British Columbia from 2000-2018



References

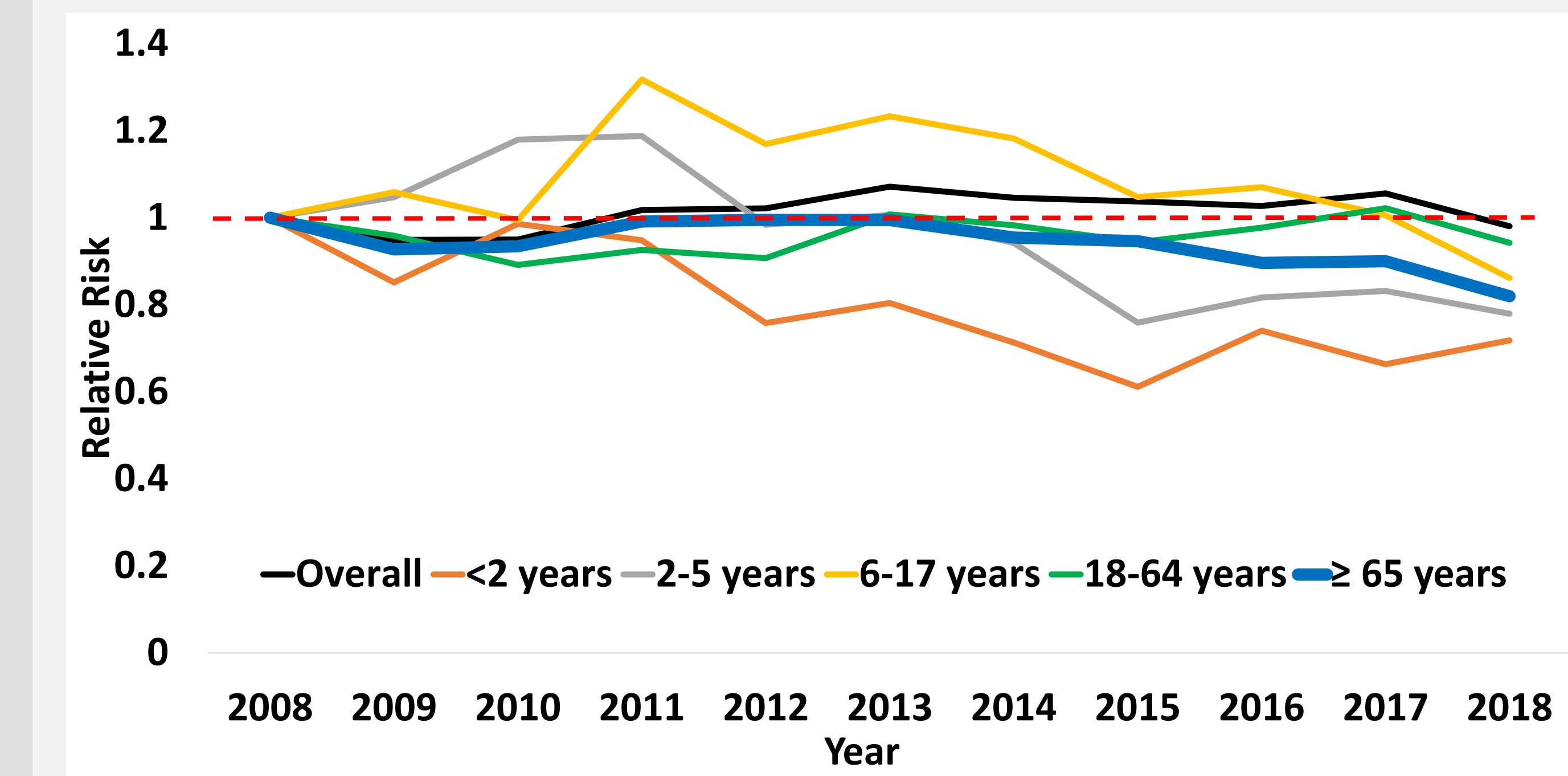
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Table 1: Comparison of overall and age-specific relative hospital admission incidence rates for all-cause pneumonia after PCV13 introduction (2011-2018) compared to baseline (2000-2010)

Age group	No of Hospitalizations	%	Incidence Rate Ratio (95% CI)
Overall	314,121		1.02 (1.0-1.04)
<2 years	6,363	2.0	0.63 (0.59-0.67)*
2-5 years	9,623	3.1	0.82 (0.77-0.87)*
6-17 years	6,279	2.0	0.73 (0.69-0.78)*
18-64 years	82,483	26.3	0.98 (0.96-1)
≥ 65 years	209,373	66.7	1.05 (1.02-1.07)*

- While no significant changes were observed at population level and those aged 18-64 years, there has been an increase in median age over time.

Figure 2: Age-specific relative risk of hospital admission from all-cause pneumonia in British Columbia after PCV13 introduction compared to baseline (2008)



- Relative risk of hospitalization from all-cause pneumonia has been the lowest in 2018 compared to 2008 in all age groups. (Figure 2).

Limitations

Although we adjusted for known confounders, we may have missed unknown confounders. Therefore, data presented in this study should be interpreted with caution.

Conclusions

Our study showed a significant reduction in all-cause pneumonia hospitalization rates in children, demonstrating the long term beneficial effect of PCV13 use. A modest increase in all-cause pneumonia hospitalization rates in older adults indicates a need for continued surveillance and further investigation.

