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# Impact of the 13-valent pneumococcal vaccine on paediatric empyema in the North of England

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On behalf of North East of England Paediatric Respiratory Infection Study Group



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## Aim

To assess the impact of the 13 valent pneumococcal vaccine (PCV-13) on the incidence of empyema in the North of England using an interrupted time series analysis.

## Background

- ❖ The incidence of empyema has been increasing in children over the last 15 years.<sup>1</sup> However a recent report has suggested that cases in the UK may now be declining.<sup>2</sup>
- ❖ *Streptococcus pneumoniae* is the predominant cause of childhood empyema in the UK, with up to 65 % of cases attributable to pneumococcal infection.<sup>3</sup>
- ❖ PCV-13 replaced the 7 valent vaccine (PCV-7) in the UK routine immunisation schedule in April 2010.
- ❖ Enhanced surveillance of pneumococcal serotypes from culture negative pleural fluid in childhood empyema in England has suggested up to 83% may be covered by PCV-13.<sup>4</sup>

## Methods

- ❖ Monthly rates of empyema in children aged <15 years who were managed in the regional management centre for NE England & Cumbria from May 1995 to November 2010 were calculated.
- ❖ A total of 313 cases of empyema were identified.
- ❖ Average monthly temperature measurements for the region were used to account for seasonality.
- ❖ Four variables including time from study start, presence of PCV-7 in the immunisation programme, presence of PCV-13 in the immunisation programme and an interaction term between temperature and month from study start were used.
- ❖ All models were fitted using a least squares regression approach.

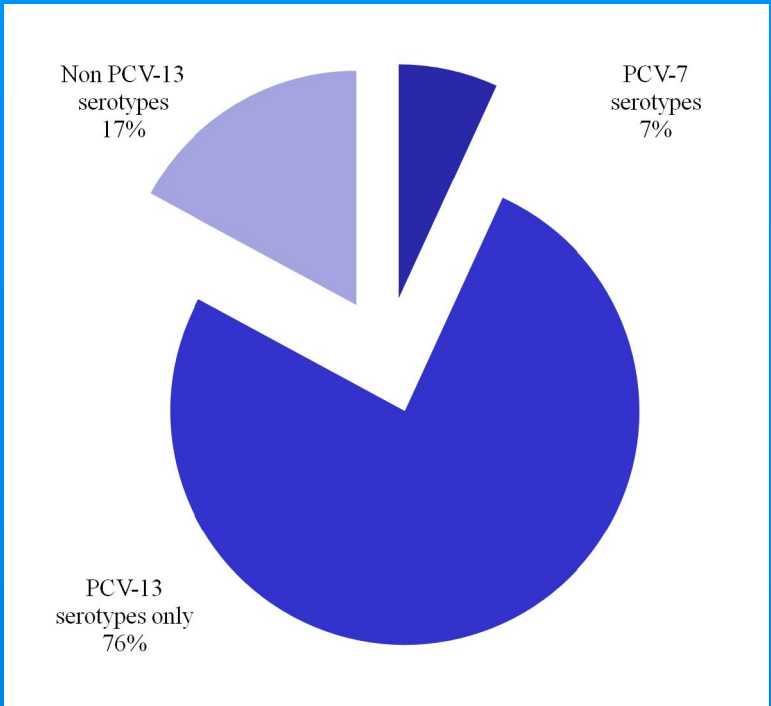


Figure 1: Proportion of PCV-7 and PCV-13 serotypes from culture negative testing of pneumococcal PCR positive pleural fluids as part of enhanced surveillance in England from 2006-2010.<sup>4</sup>

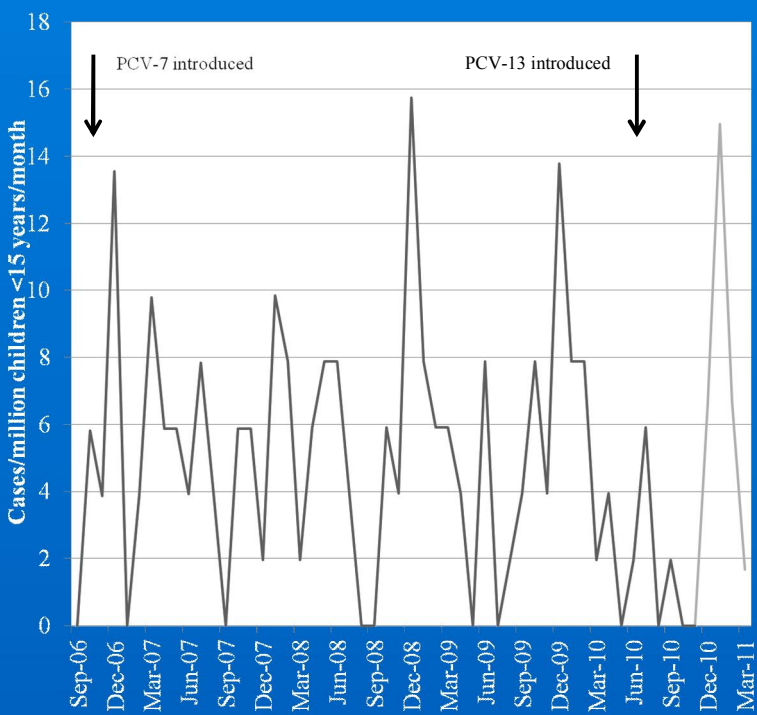


Figure 2: Monthly rate of childhood empyema cases in Northern England following the introduction of PCV-7 in September 2006

	Co-efficient	95 % Confidence Intervals	p-value
Time From Study Start	0.011	0.0074 to 0.014	<0.0001
PCV-7	-0.019	-0.40 to 0.36	0.92
PCV-13	-0.87	-1.52 to -0.21	0.0099
Interaction Term (Month From Study Start * Mean Monthly Minimum Temperature)	-0.00072	-0.00098 to -0.00045	<0.0001

Table: Results of interrupted times series analysis

## Results

- ❖ The introduction of PCV-13 was associated with a significant reduction in the number of cases of empyema in the North of England ( $p=0.0099$ ). Cases reduced on average by 0.42 cases per million children (<15 years) per month in months following the introduction of PCV-13.
- ❖ No significant impact was observed on the number of cases from the introduction of PCV-7 ( $p=0.92$ ).

## Discussion

- ❖ Our results suggest that the introduction of the PCV-13 immunisation has been associated with a reduction in the incidence of childhood empyema in the North of England.
- ❖ A subsequent analysis using data up to April 2011 has confirmed this reduction in incidence.
- ❖ It would be premature to conclude a causal relationship with the introduction of PCV-13 given the time span involved and the target age group of the vaccine.
- ❖ However given the potential impact of PCV-13 on childhood empyema as suggested by enhanced surveillance, these results give reason to be hopeful that the incidence of empyema may continue to fall.
- ❖ Further work is required to establish whether this finding is generic across the UK.

## Conclusion

The introduction of PCV-13 was associated with a decrease in paediatric empyema, although it is premature to conclude a causal relationship at present.

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