

SEVERE OUTCOMES ATTRIBUTED TO INFLUENZA AND RESPIRATORY SYNCYTIAL VIRUS (RSV) IN ENGLAND, THE NETHERLANDS AND SPAIN

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BACKGROUND

The necessary health impact data needed for decision making regarding paediatric influenza vaccination in Europe is lacking (particularly for very young age groups). We examined the burden of disease in children using rates of admission for primary cause pneumonia or influenza (P & I) as the main outcome measure in England, the Netherlands and Spain.

METHODS

Weekly virological data for influenza and RSV, along with age-specific, hospitalization data from England, the Netherlands and Spain from 3-4 seasons were used in a regression model, the EPIA model (see formula below). This model allowed us to control for the effect of RSV, another significant and co-circulating respiratory pathogen in children. Diagnostic codes used to define the outcome variable can be seen in Table 1.

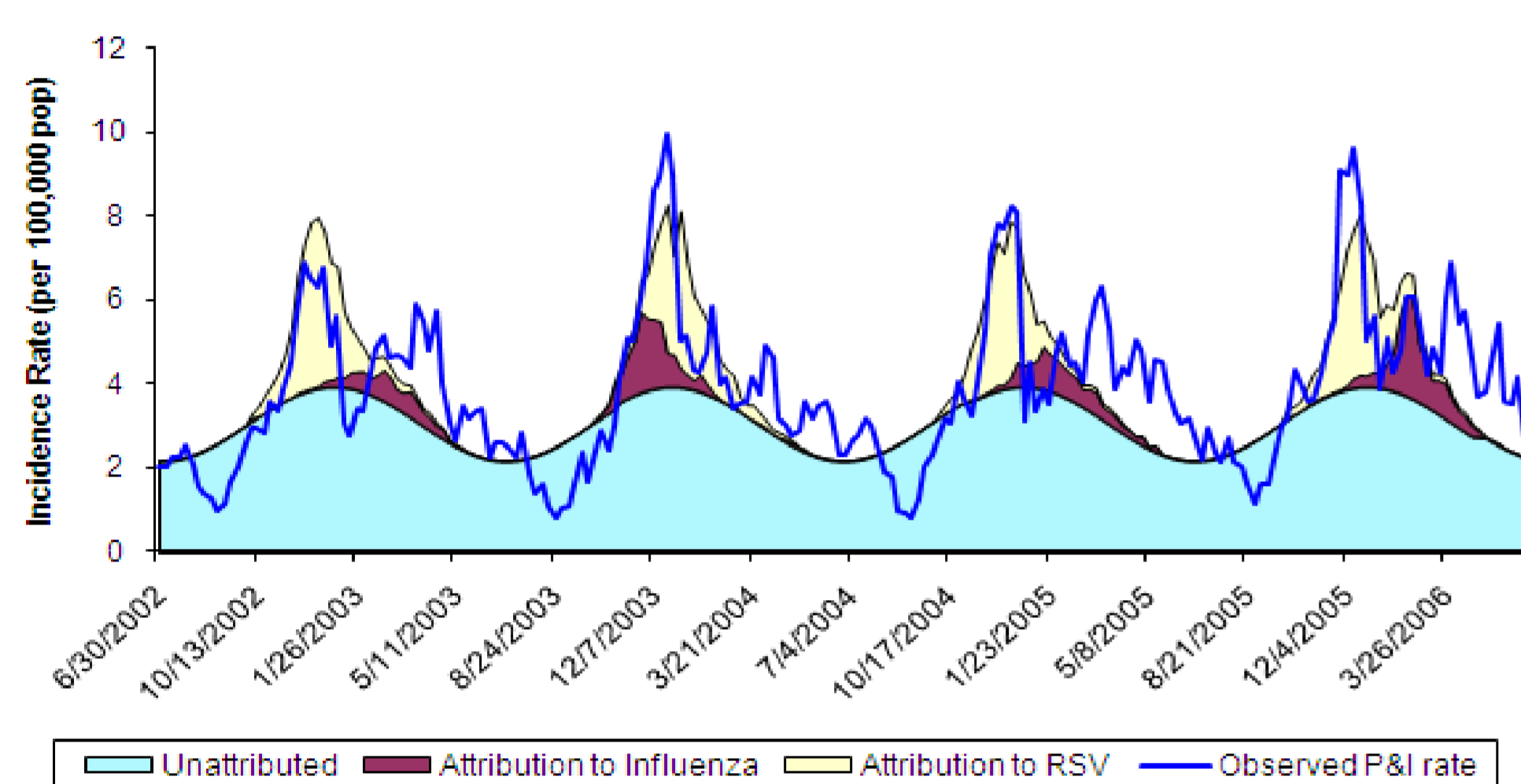
Table 1. Diagnostic codes used in the current study

| Diagnosis | ICD-9 | ICD-10 |
|-----------|---------|---------|
| Pneumonia | 480-486 | J12-J18 |
| Influenza | 487 | J09-J11 |

EPIA multiple regression model:

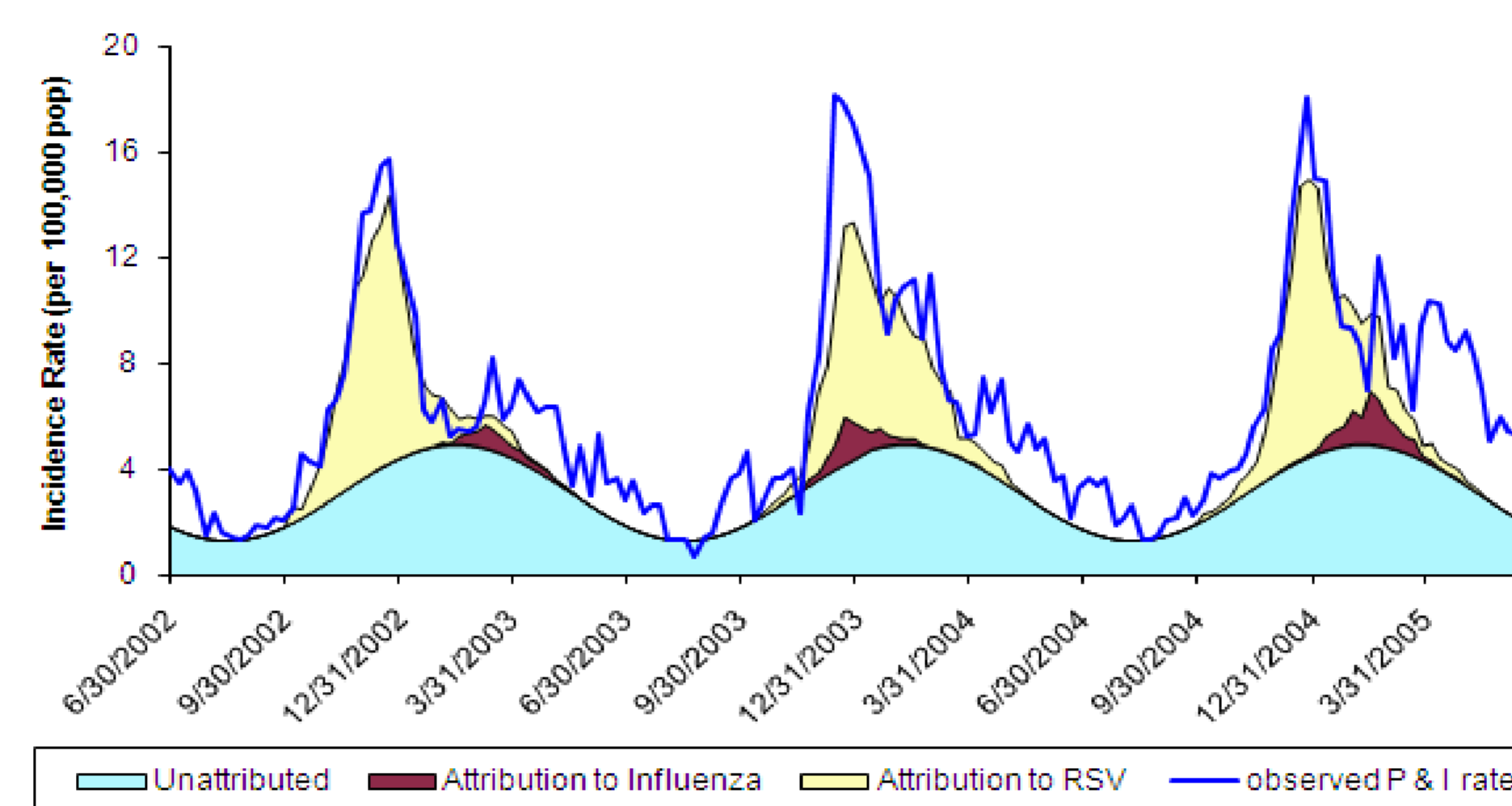
$$P \& I \text{ hospitalization rate} = \beta_0 + \beta_1 * RSV + \beta_2 * \text{Influenza} + \beta_3 * \sin(2\pi t/52.2) + \beta_4 * \cos(2\pi t/52.2) + \beta_5 * t$$

English children 0-4 years of age



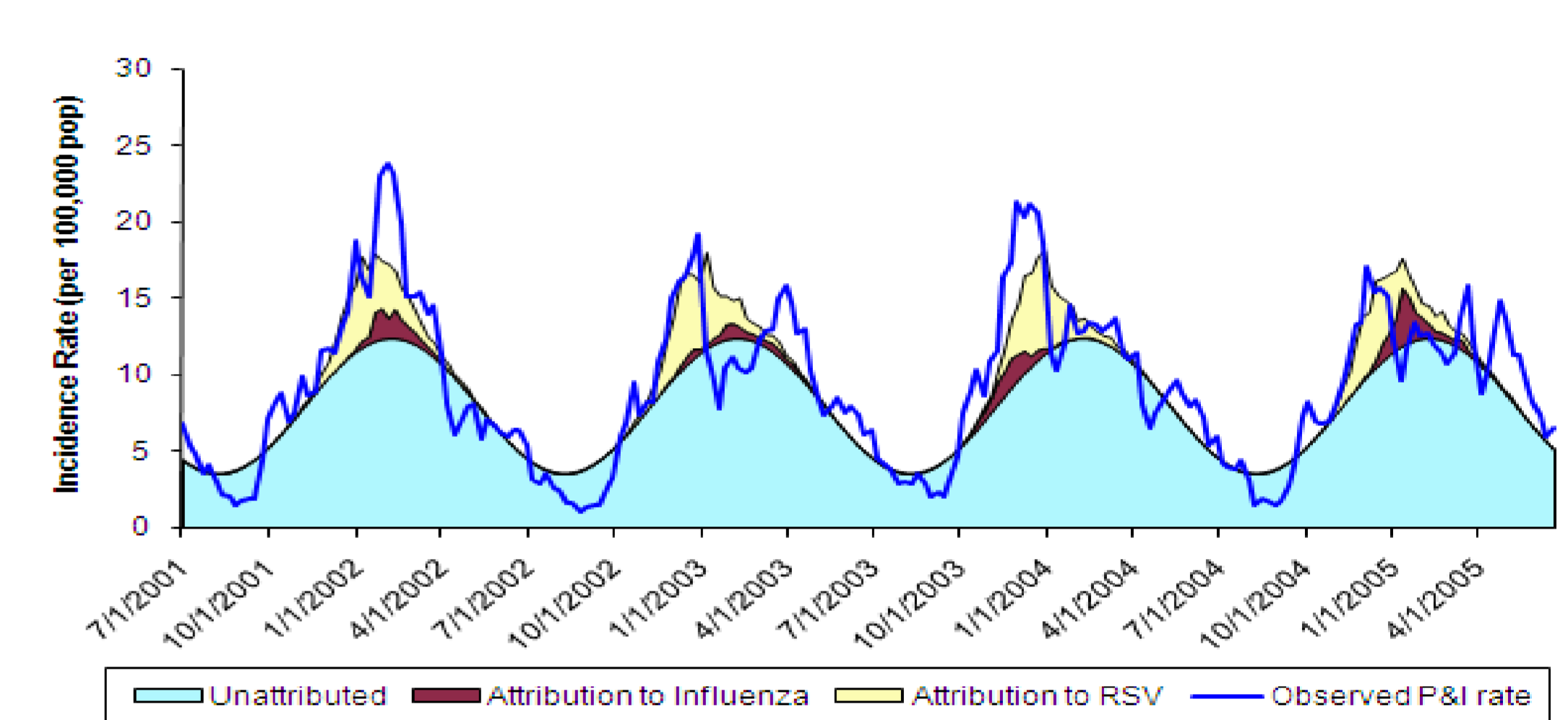
Correlation between observed and predicted P & I rate: $r(207) = .85, p < .0001$

Dutch children 0-4 years of age



Correlation between observed and predicted P & I rate: $r(152) = .93, p < .0001$

Spanish children 0-4 years of age



Correlation between observed and predicted P & I rate: $r(208) = .89, p < .0001$

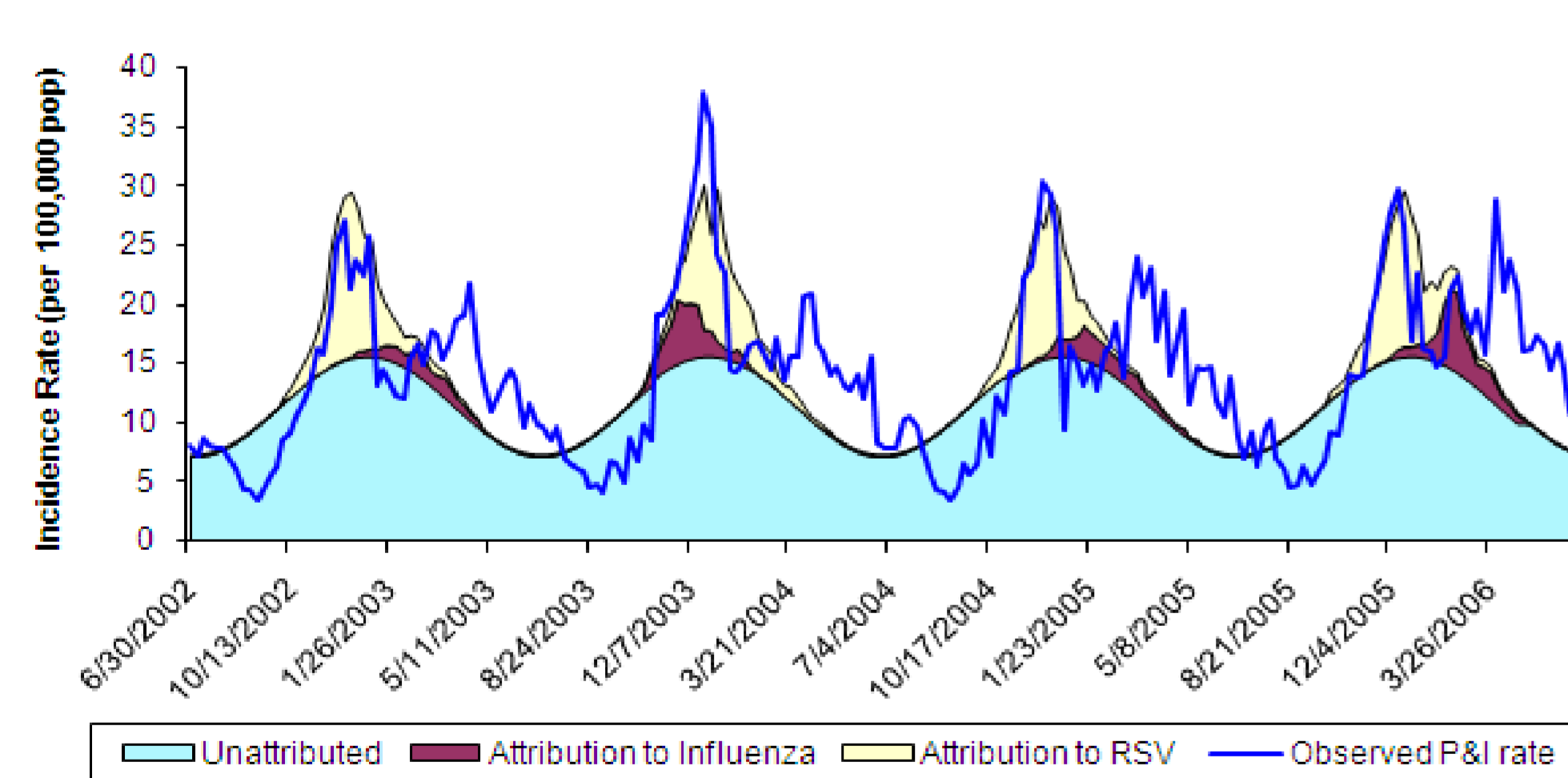
RESULTS

England: During the years 2002-2006, an average of 204 (range: 187-222) per 100,000 children 0-4 years of age were hospitalized with a P&I code. Between 8 and 17 of these observed cases were attributed to influenza and 30-35 to RSV. Admission rates were observed to be nearly four times higher (between 693 and 784 per 100,000) in children under 1 year of age. The model attributed cases to influenza and RSV in a similar relative pattern (22-46 and 103-119 respectively).

The Netherlands: Between 2002 and 2005, an average of 317 (range: 288-355) per 100,000 children age 0-4 were hospitalized with a pneumonia and/or influenza diagnosis. The model attributed between 5 and 12 of these cases to influenza and 76-89 to RSV. When children under 1 year of age were examined, the P&I rate nearly doubled (616 per 100,000 on average). Between 7 and 15 of these hospitalizations were attributed to influenza and 204-237 to RSV.

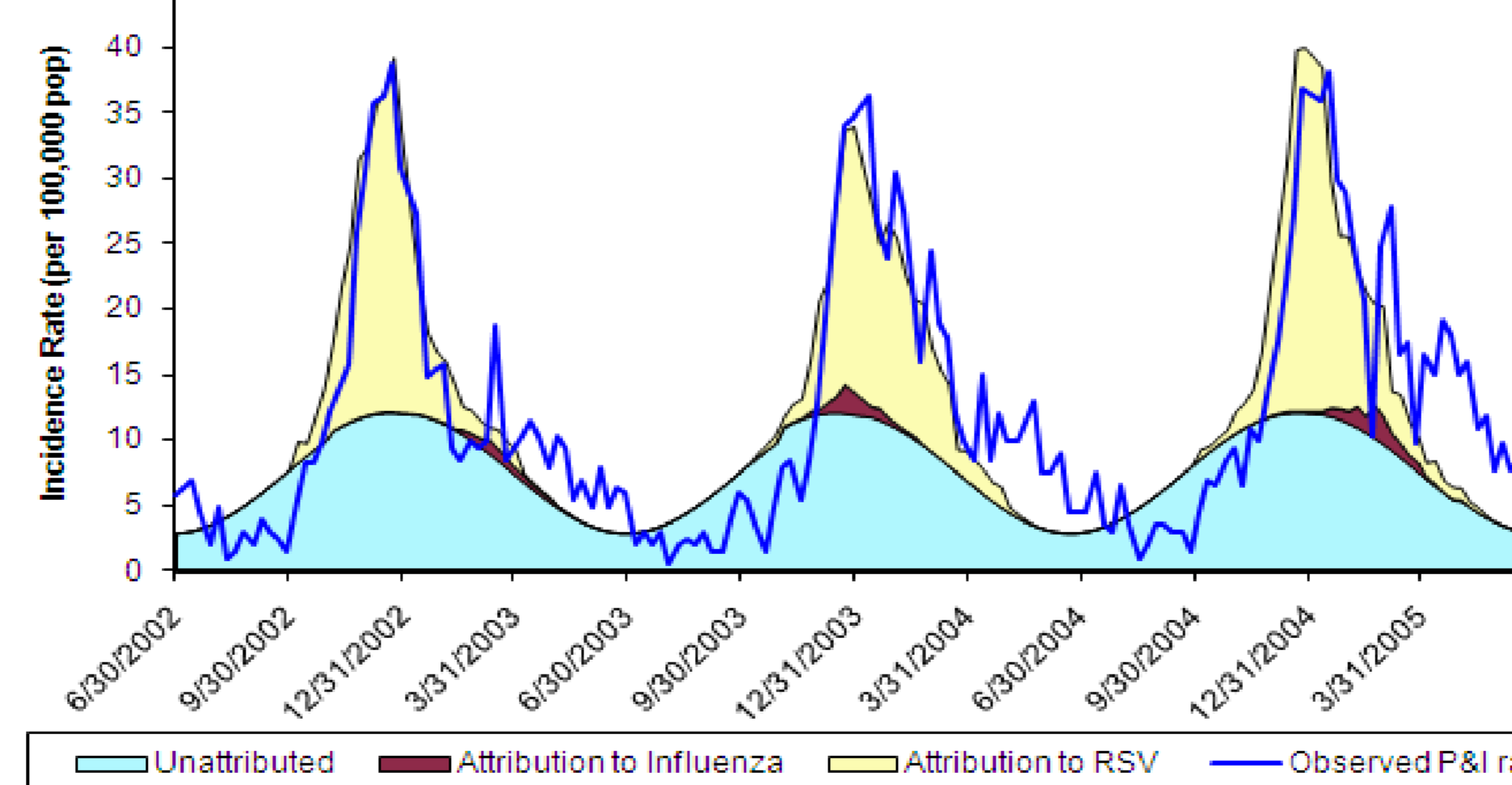
Spain: Between 2001 and 2005, an average of 483 (range: 452-505) per 100,000 children aged 0-4 were admitted to the hospital with a pneumonia and/or influenza diagnosis. Of these admissions, the model attributed between 10 and 21 cases to Influenza and 50-60 to RSV (per 100,000 children aged 0-4). Children under 1 year of age were admitted for P&I diagnoses at a rate of 586 (range: 538-619) per 100,000 with the model attributing 18-36 of these cases to Influenza and 980-95 to RSV (per 100,000 children under 1 year of age).

English children less than 1 year of age



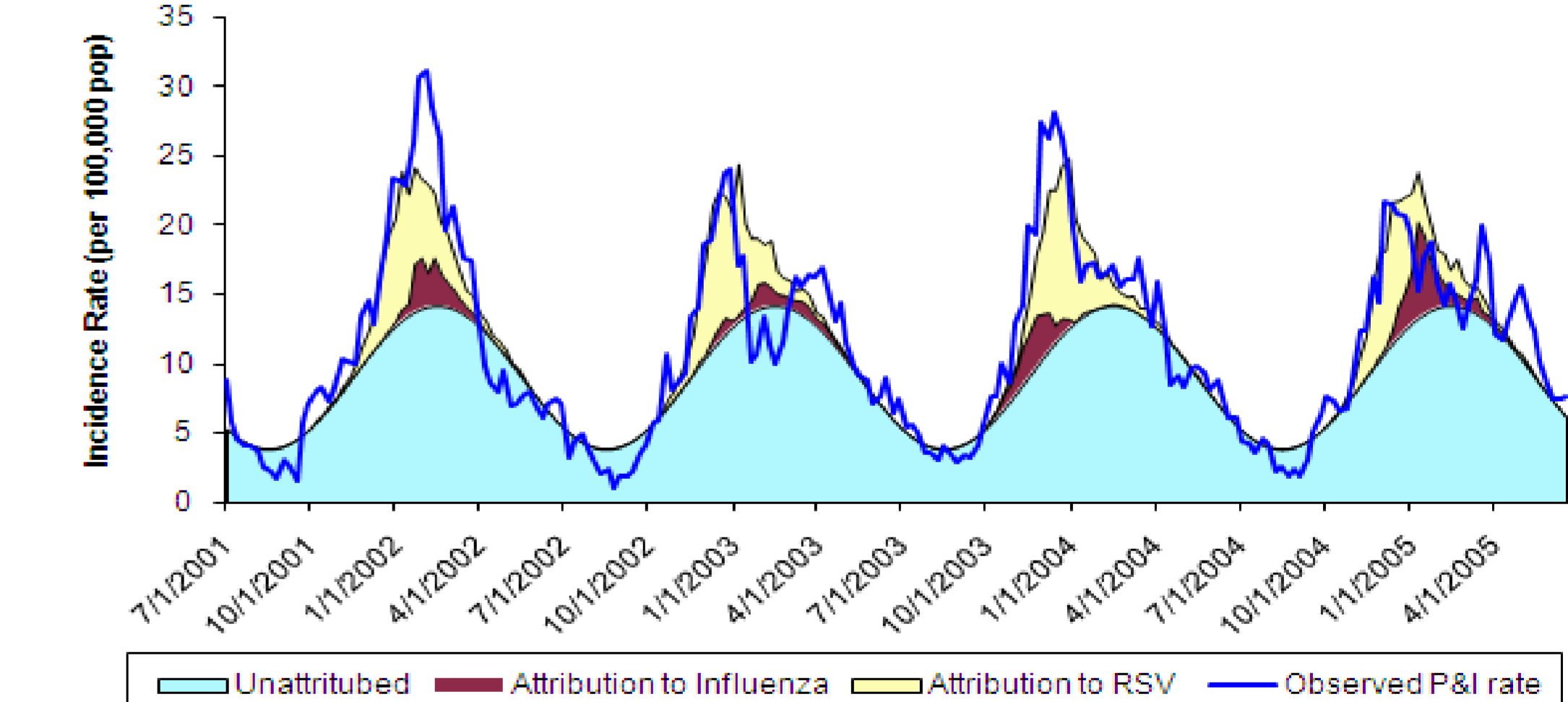
Correlation between observed and predicted P & I rate: $r(207) = .86, p < .0001$

Dutch children less than 1 year of age



Correlation between observed and predicted P & I rate: $r(152) = .94, p < .0001$

Spanish children less than 1 year of age



Correlation between observed and predicted P & I rate: $r(208) = .92, p < .0001$

DISCUSSION

- There is a paucity of European evidence regarding severe outcomes attributed to influenza and RSV in young and very young children.
- The current study employed a multiple regression model to attribute P & I hospitalizations to influenza and RSV.
- Across the three countries studied, incidence rates of pneumonia and influenza hospitalizations were two to four fold higher in children < 1 year of age compared to those 0 to 4 years of age.
- Within each country and age group, RSV accounted for more hospitalizations than influenza. Sensitivity analyses revealed this finding was not related to differential volumes of virus data.
- Many factors have the potential to affect incidence rates between countries (e.g., type of health system, health seeking behaviours) therefore, comparison of data /results across countries should be done with caution.
- Future directions include further model refinement in addition to analysis of other age groups and diagnoses (e.g., sepsis, other acute respiratory infections), to obtain a more complete picture of disease burden attributable to influenza.

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