Holiday Spikes in Pneumococcal Disease among Older Adults

TO THE EDITOR: Rates of invasive pneumococcal disease in the United States increase dramatically, or "spike," during winter holidays.[1] We analyzed population-based surveillance data to determine whether spikes may be caused by increased transmission from children to older adults.

Pneumococci spread through upper respiratory secretions, especially those of young children.[2] Certain serotypes disproportionately colonize young children.[3] The introduction of the pediatric heptavalent pneumococcal conjugate vaccine (PCV7; Prevnar, Wyeth) in 2000 led to a decrease in invasive pneumococcal disease among vaccinated children and reduced transmission to unvaccinated persons.[2,4]

We compared age, sex, and serotype distributions during spikes (defined as ≥5 days in which smoothed rates of invasive pneumococcal disease exceeded the 95% confidence interval surrounding a sinusoidal seasonal baseline) with periods in which there were no spikes (the December and January days were not included in the spikes) before and after introduction of the vaccine among 14 to 28 million residents in 7 to 10 sites in the Active Bacterial Core surveillance system, a component of the Emerging Infections Program of the Centers for Disease Control and Prevention,[5] during 1995–2006. The study included the period before the introduction of the vaccine (July 1, 1995, through June 30, 2000), during transition (July 1, 2000, through June 30, 2001), and after the introduction of the vaccine (July 1, 2001, through June 30, 2006). Serotypes were classified as pediatric serotypes if they were detected significantly ($P<0.001$) more frequently among children younger than 5 years of age or as adult serotypes if they were detected significantly more frequently among adults older than 17 years of age. We tested for artifacts of surveillance (e.g., deferred health care-seeking behavior or delayed reporting).

We analyzed 39,841 episodes of invasive pneumococcal disease during more than 222 million person-years of surveillance. Spikes occurred annually around winter holidays before introduction of the vaccine and in one of five winters thereafter; no spikes occurred during other sea-

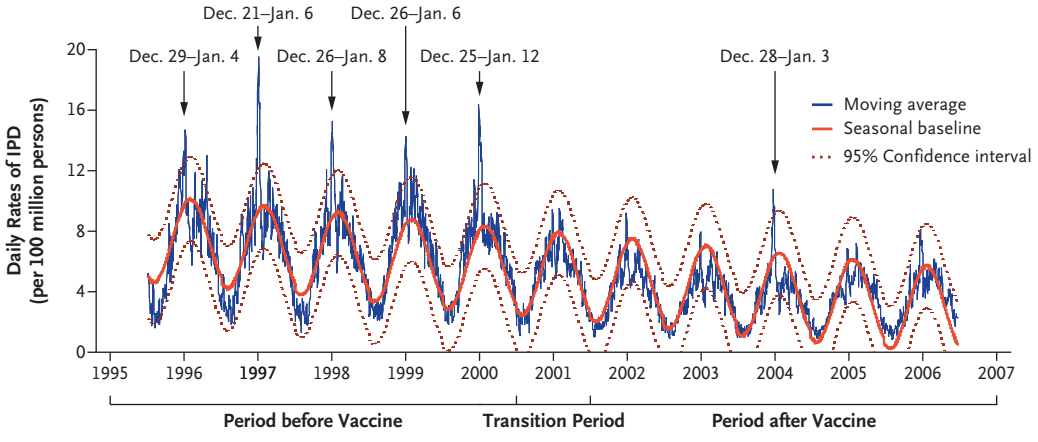

Figure 1. Incidence of Invasive Pneumococcal Disease, According to Data from Active Population-Based Surveillance, 1995–2006.

The blue line indicates a 5-day simple moving average of daily rates of invasive pneumococcal disease per 100 million persons. The red line indicates a seasonal baseline curve fitted by least-squares regression. The dashed red lines indicate 95% confidence intervals surrounding the fitted seasonal curve. IPD denotes invasive pneumococcal disease.

sons (Fig. 1, and Table 1 in the Supplementary Appendix, available with the full text of this letter at NEJM.org). Before the introduction of the vaccine, the proportion of invasive pneumococcal disease occurring among adults 50 years of age or older nearly doubled during spikes (odds ratio relative to children <5 years of age, 1.92; 95% confidence interval [CI], 1.63 to 2.27). Among these older adults, the proportion of women was higher during spikes than during periods in which there were no spikes (58% vs. 52%, P=0.011). Before the introduction of the vaccine, four serotypes (6B, 14, 18C, and 19F) were detected significantly more frequently among children younger than 5 years of age, and after the introduction of the vaccine, seven serotypes (6B, 15B/C, 18C, 19A, 19F, 33F, and 38) were detected significantly more frequently among this group of patients. Before the introduction of the vaccine, among persons older than 50 years of age, the odds of infection with pediatric serotypes was 42% higher (odds ratio, 1.42; 95% CI, 1.10 to 1.82) than the odds of infection during periods in which there was no spike. No significant differences in age or serotype distribution were detectable during the period after vaccination, but power was limited. No spikes occurred in the rates of invasive group B streptococcal disease during this period. We found no evidence of artifacts of surveillance.

Our observations that older adults, especially women, were disproportionately affected during spikes and that their disease was disproportionately caused by pediatric serotypes suggest that spikes in invasive pneumococcal disease may be caused by increased transmission from children to older adults. This transmission could be facilitated by seasonal social gatherings.

Our analysis has limitations. Case patients were not interviewed directly; we presumed that the exposure of older adults to children was increased during winter holidays. This analysis did not evaluate an association between the incidence of invasive pneumococcal disease and the circulation of influenza. However, the variable timing and prolonged duration of elevated activity (≥8 weeks) make the circulation of influenza an unlikely explanation for the brief spikes in invasive pneumococcal disease that consistently occurred around winter holidays.

These findings highlight the role children may play in transmitting pneumococci to older adults.

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