

## The Burden of Pediatric Influenza

Neuzil KM, Mellen BG, Wright PF, Mitchel EF Jr, Griffin MR. The effect of influenza on hospitalizations, outpatient visits, and courses of antibiotics in children. *N Engl J Med* 2000;342:225-31.

### Study Overview

**Objective.** To assess the burden of influenza in healthy children.

**Design.** Retrospective cohort study.

**Setting and participants.** Children younger than 15 years considered at low risk for influenza who were enrolled in the Tennessee Medicaid program between 1974 and 1993. Nine percent of subjects were excluded from the study after being classified as high risk due to institutionalization or disability, low birth weight and age less than 1 year, or high-risk condition suffered in the year before entry into the study. High-risk conditions included congenital heart disease and other selected cardiac conditions, bronchopulmonary dysplasia, hospitalization for respiratory conditions, asthma, cystic fibrosis, sickle cell disease, diabetes, cancer, HIV infection, chronic use of oral corticosteroids, and chronic renal disease. There were 2,035,143 person-years of observation.

**Main outcome measures.** Rates of mortality and associated morbidity, including hospitalizations for acute cardiopulmonary conditions, outpatient visits, and courses of antibiotics. Differences in the rates of events occurring when influenza virus was circulating and rates occurring from November to April when no influenza was present in the community were used to calculate influenza morbidity.

**Main results.** The mean duration of the influenza season was 63 days (range, 0 to 119 days). Mortality from selected acute cardiopulmonary conditions was 0.077 per 10,000 children (95% confidence interval [CI], 0.001 to 0.154). Of the 154 deaths in the study cohort, 87 (56%) occurred among children younger than 1 year.

In all seasons, rates of hospitalization were highest in children younger than 6 months, and rates decreased with increasing age. During periods when influenza virus was circulating, the yearly average number of hospitalizations for cardiopulmonary conditions in excess of expected totals was 104 per 10,000 children younger than 6 months, 50 per 10,000 children between 6 and 12 months, 19 per 10,000 children

between 1 year and 3 years, 9 per 10,000 children between 3 and 5 years, and 4 per 10,000 children between 5 and 15 years. For every 100 children, an annual average of 6 to 15 outpatient visits and 3 to 9 courses of antibiotics were attributed to influenza. In winter, 10% to 30% of the excess number of courses of antibiotics occurred during periods when influenza virus was circulating.

### Conclusion

Healthy children younger than 1 year are hospitalized for illnesses attributable to influenza at rates similar to those for high-risk adults. Young children should be considered at high risk for influenza.

### Commentary

Acute respiratory disease due to viral infection is the most common reason for hospital stays and outpatient visits among children in the United States [1]. During epidemics, the rates of infection with influenza virus may exceed 40% in preschool children and 30% in school-age children [2,3]. In addition, school-age children serve as the main route through which influenza is introduced into the household.

The high rates of viral infection among children and the key role that children play in transmitting influenza have been well documented. However, this study makes an important contribution to the literature because of its large cohort of children in a well-defined population, its long study period, and its comprehensive documentation of influenza's burden in terms of mortality and inpatient and outpatient morbidity.

### Applications for Clinical Practice

Stronger recommendations for immunizing family members of children younger than 1 year should be considered. However, the cost, safety, and inconvenience of such an immunization program must be examined before an expanded strategy can be definitively recommended.

### References

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2. Monto AS, Sullivan KM. Acute respiratory illness in the community. Frequency of illness and the agents involved. *Epidemiol Infect* 1993;110:145-60.
  3. Longini IM Jr, Koopman JS, Monto AS, Fox JP. Estimating household and community transmission parameters for influenza. *Am J Epidemiol* 1982;115:736-51.

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