

# Use of Surveillance Data to Measure the Impact of Viral Infections among Young Children

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## OBJECTIVE

To use surveillance data to estimate resource utilization and parental lost productivity associated with influenza and respiratory syncytial virus (RSV) infections among young children.

## BACKGROUND

Respiratory viruses cause substantial morbidity and costly resource utilization among young children, especially during the winter months [1]. Accurate estimates of the impact of these viruses are important in guiding prevention efforts and measuring the impact of public health interventions. Previous studies have focused on the rate of hospitalizations resulting from viral infections, particularly those attributable to influenza virus for which a vaccine is available [2], but have not included healthcare use in the emergency department (ED) nor considered the impact of other viruses such as RSV, for which limited preventative methods are available. We used ED surveillance data for acute respiratory infection to measure the population-based impact of specific viruses.

## METHODS

The setting was the ED of an urban tertiary care pediatric hospital. Two retrospective patient populations were identified. The first was comprised of patients  $\leq 7$  years of age treated in the ED for an acute respiratory infection (ARI) between November and April during the 13 year period from 1993 to 2006. ARIs were identified using a respiratory classifier based on chief complaints, which are elicited from all patients presenting to the ED. The second population included all children  $\leq 7$  years of age who had viral testing performed and were infected with influenza or RSV. A cohort of patients with ARIs was recruited prospectively during the winter months of 2003-2004 and 2004-2005 and tested for influenza and RSV. Detailed interviews were conducted to measure resource utilization among children infected with these viruses. State-wide ED marketshare and U.S. Census data enabled extrapolation to calculate population-based rates of ED visits for influenza and RSV and associated resource utilization. Variances for 95% confidence intervals (CIs) were estimated using the delta method and conditional probability rules.

## RESULTS

During the 13 year study period, the mean yearly rate of patients  $\leq 7$  years of age presenting to EDs with influenza and RSV infections was 6.8 (95%CI: 5.6, 8.3) and 29.6 (95%CI: 26.6, 33.0) per 1000 children, respectively. Population-level resource use is described in Table 1:

Resource type	Rate in MA Pop./1000 Children (95%CI)	
	Influenza	RSV
Medication in ED	3.4 (2.4,4.8)	22.0 (19.0, 25.4)
X-ray study in ED	3.0 (2.1,4.4)	20.4 (17.4, 23.9)
Hospital admission	0.9 (0.4, 1.9)	11.8 (9.3, 14.9)
Primary care visit	4.8 (3.7, 6.3)	23.2 (20.1, 26.6)
Antibiotic use	3.1 (2.1, 4.4)	12.7 (8.5, 18.9)
School missed	3.3 (2.3, 4.7)	10.9 (8.5, 13.9)
Workday missed	4.4 (3.3, 5.8)	19.6 (16.6, 23)

Among children  $< 2$  years of age, the rate of parental missed work days attributable to influenza infections was 4.6 (95%CI: 1.9, 7.6) compared with 29.7 (95%CI: 21.4, 41.1) per 1000 children for RSV infections. Among children 2-4 years of age, the rates were 1.1 (95%CI: 0.47, 2.6) and 2.5 (95%CI: 1.4, 4.2) per 1000 children, respectively, for influenza and RSV infections.

## CONCLUSIONS

Using surveillance data, we were able to determine rates of healthcare utilization for influenza and RSV infections. High rates of use were found for infections by both viruses. RSV resulted in significantly higher ED and outpatient resource utilization as compared with influenza, especially among children  $< 2$  years of age, indicating that improved, age-specific prevention efforts are required for this virus. This method of population-based measurement demonstrates an important use of surveillance data which could be used to guide prevention strategies.

## REFERENCES

- [1] Monto AS, Sullivan KM. Acute respiratory illness in the community: frequency of illness and the agents involved. *Epidemiol Infect.* 1993; 110: 145-160.
- [2] Neuzil KM, Mellen BG, Wright PF, Mitchel EF, Griffin MR. The effect of influenza on hospitalizations, outpatient visits, and courses of antibiotics in children. *N Engl J Med.* 2000;342:225-231.