

# Timeliness of Ambulatory Data for Age-Specific ILI Surveillance

Emily H. Chan, BSc, Robyn Tamblin, PhD, David Buckeridge, MD, PhD

McGill Clinical and Health Informatics, McGill University

## OBJECTIVE

Using physician billing data from a single source population, we aimed to compare age-group and visit setting specific patterns in the timing of patients presenting to community-based healthcare settings and hospital emergency departments (ED) for influenza-like illnesses (ILI). We thus evaluate the utility of focusing on particular age-groups and care settings for syndromic surveillance of ILI in ambulatory care.

## BACKGROUND

While there has been some work to evaluate different data sources for syndromic surveillance of influenza (1-3), no one has yet assessed the utility of simultaneously restricting data to specific visit settings and patient age-groups using data drawn from a single source population. Furthermore, most studies have been limited to the ED, with few evaluating the timeliness of data from community-based primary care.

## METHODS

Weekly counts of visits for ILI (4) to community-based care settings (e.g. private offices, medical clinics) and to hospital EDs were tabulated by age-group and setting type from a sample of International Classification of Diseases, Ninth-Revision (ICD-9) coded fee-for-service billing claims from 1998-2003 in Quebec, Canada. Autoregressive integrated moving average (ARIMA) models were fit to each subset of the ILI visits time series to model temporal autocorrelation and holiday effects. The residuals represent the time series with these effects removed. The same models were then applied to a common reference time series of weekly counts of pneumonia and influenza (P&I) hospitalizations, and the residuals from the two series were cross-correlated across a range of lags to obtain their cross-correlation function (CCF). We noted the lags at which the peak correlation and other significant ( $\alpha=0.05$ ) correlations occurred. These analyses were first conducted using the entire study period, and then just for each influenza season.

## RESULTS

While the results varied each year, ILI visits to community-based care settings and ILI visits by children generally provided earlier indications of an influenza season than ILI visits to EDs or ILI visits by adults. ILI visits by children aged 2 to 17 years to community-based care settings tended to demonstrate significant correlations against P&I hospitalizations at the greatest lags, with generally a 2 week lead time (up to 3 weeks in certain years). More specifically,

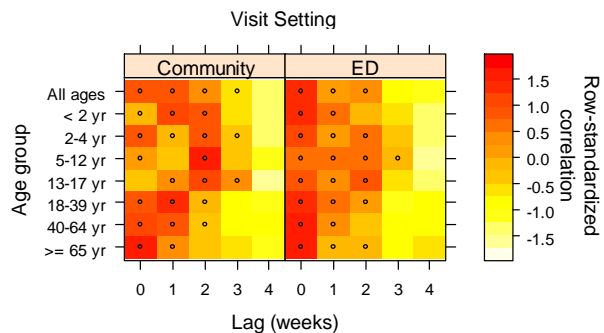


Figure 1 – A heat-map representation of the CCFs between various age group and visit setting specific subsets of ILI visits and P&I hospitalizations, 1998-2003. Correlations controlled for autocorrelation and standardized to each subset are represented on a colour gradient. Dots indicate significance ( $\alpha=0.05$ ).

ILI visits by 5 to 17 year olds to community-based settings stood out in particular due to their pronounced correlations at the earliest lags.

## CONCLUSIONS

Using a common cohort of patients to compare different age-groups and two types of ambulatory care settings, we found that ILI visits by school-aged children to community-based care settings tended to be the earliest indicators of an influenza season within physician billing data, perhaps for the reason that community-based care rather than ED care may be sought first for mild symptoms exhibited during early stages of illness. However, annual variations such as circulating strains may modify the utility of different subsets each year. These findings have important implications for influenza surveillance and strategies for epidemic control such as vaccination and school closure policies.

## REFERENCES

1. Brownstein JS, Kleinman KP, Mandl KD. Identifying pediatric age groups for influenza vaccination using a real-time regional surveillance system. *Am J Epidemiol* 2005;162:686-93.
2. Olson DR, Heffernan RT, Paladini M, et al. Monitoring the impact of influenza by age: emergency department fever and respiratory complaint surveillance in New York City. *PLoS Med* 2007;4:e247.
3. Sebastian R, Skowronski DM, Chong M, et al. Age-related trends in the timeliness and prediction of medical visits, hospitalizations and deaths due to pneumonia and influenza, British Columbia, Canada, 1998-2004. *Vaccine* 2008;26:1397-403.
4. Marsden-Haug N, Foster VB, Gould PL, et al. Code-based syndromic surveillance for influenzalike illness by International Classification of Diseases, Ninth Revision. *Emerg Infect Dis* 2007;13:207-16.

Further Information:

Emily Chan, [emily.chan@mail.mcgill.ca](mailto:emily.chan@mail.mcgill.ca)