

# Syndromic surveillance for localized outbreaks of lower-respiratory infections: does it work?

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## OBJECTIVE

To evaluate whether syndromic surveillance can detect localized outbreaks of lower-respiratory infections (LRI's) with limited numbers of alarms in time.

## BACKGROUND

The SARS epidemic in 2003, the bioterrorism attacks in 2001 and the threat of an influenza pandemic have urged many countries to invest in syndromic surveillance systems. In order to increase the sensitivity for detection of localized outbreaks, detection of local syndrome elevations can be performed. E.g. for the SARS outbreak in Hongkong, it is believed that a space-time cluster analysis would have detected the highly unusual clustering of severe acute respiratory syndrome cases. However, there are also doubts about the effectiveness of syndromic surveillance, in particular the trade off between sensitivity and specificity: even if an outbreak is detected by syndromic surveillance, this cannot lead to an effective response if a high number of false alarms is generated as well.

## METHODS

Two large outbreaks of legionnaires' disease (LD) in the Netherlands (in 1999 and in 2006) were used as test cases for examining whether syndromic surveillance picks up lower-respiratory infection (LRI) outbreaks, independent of detection of the causative pathogen. Using retrospective data, we simulated a prospective syndromic surveillance analysis on hospitalizations by running the Satscan scan-statistic for each week in the analysis period. Syndromic data was collected from the Dutch National Medical Register (discharge and secondary diagnoses by date of hospitalization). We included all hospitalizations with any kind of lower-respiratory infection – which is assumed to be a feasible prospective syndrome case definition on the day of hospitalization. We evaluated the total number of detected clusters as well as the overlap between consecutive clusters. To assess (probable) causes for the detected clusters, we looked into regional elevations of influenza-like-illness and respiratory syncytial virus (RSV) lab-detections, as well as the distributions of ICD codes within the detected clusters.

## RESULTS

Both test-case outbreaks were detected by LRI clusters that approximately coincided with the actual de-

tection date of these outbreaks (these LRI-clusters contained high levels of patients with LD). Between feb-1999 and sept-2006 a total of 221 LRI-clusters were signaled by the scan-statistic (1-3 per week). Most clusters formed sets of consecutive overlapping clusters (total 48 sets, on average 6 sets of consecutive overlapping cluster alarms per year). Table 1 gives the distribution of most probable causes for the LRI-clusters (preliminary results), being: local influenza and RSV activity, a registry artifact and/or undetected local respiratory outbreaks (due to small size and/or crossing different regions of responsibility).

(probable) causes of LRI clusters	Sets of consecutive overlapping clusters	Weekly clusters
Local RSV and/or influenza	28	154
Registry artifact	1	7
LD 1999 outbreak	1	10
LD 2006 outbreak	1	4
Unknown/possibly undetected local outbreaks	17	46
Total	48	221

Table 1 –Distribution of (probable) causes for weekly clusters and sets of consecutive overlapping clusters between feb1999-sep2006

## CONCLUSIONS

This retrospective study shows that syndromic surveillance can detect local outbreaks of LRI's in a timely fashion, independent of a specific diagnosis. The observed rate of alarms in time could lead to a modest number of signal investigations especially if surveillance on local RSV and influenza activity is also available. Therefore syndromic surveillance on hospitalizations would be a valuable tool for detection of localized LRI outbreaks.

## REFERENCES

- [1]. Kulldorff M, Heffernan R, Hartman J, Assuncao R, Mostashari F. A Space-Time Permutation Scan Statistic for Disease Outbreak Detection. *PLoS Med* 2005; 2(3):e59.
- [2]. Abrams AM, Kleinman KP. A SaTscan macro accessory for cartography (SMAC) package implemented with SAS software. *Int J Health Geogr* 2007;6:6.

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