

# What is the Value of a Positive Syndromic Surveillance Signal?

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## OBJECTIVE

We evaluated the positive predictive value of signals detected by our syndromic surveillance system.

## BACKGROUND

One criterion for evaluating the effectiveness of a surveillance system is the system's positive predictive value.<sup>1</sup> To our knowledge few studies have described the positive predictive value of syndromic surveillance signals for naturally occurring conditions of public health importance.

## METHODS

Our syndromic surveillance system receives data from 19 emergency departments (EDs) in King County. EDs send data on all visits that occurred the previous day. Aberrations in the data trigger further epidemiological evaluation when we detect an alarm signal corresponding to a statistically significant increase over expected observations based on baseline data using the cumulative sums (CUSUM) methods of the CDC,<sup>2</sup> or based on the regression, autoregressive modeling and scan statistics methods of the Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE).<sup>3</sup> Investigations are initiated for alarm signals that meet these criteria and any report of a chief complaint or diagnosis that is suggestive of a notifiable condition. Between April 2005 and September 2006, we recorded all signals that were detected by our system that resulted in follow-up with the reporting institution. Information recorded included the type of signal detected; the date when the event occurred; the date the signal was detected by our system; the number of cases comprising the signal; whether the signal was based on chief complaint or ICD-9 data; and whether or not the signal was detected through our traditional communicable disease reporting mechanisms (e.g., via phone or fax). A signal was classified as a true positive if it was confirmed by the reporting institution, and classified as a false positive otherwise. Due to difficulties in following up on non-King County residents, individual reports of chief complaints or diagnoses suggestive of a notifiable condition were excluded from this analysis if the patient was not a King County resident.

## RESULTS

We estimate that our system detects an average of 10 signals per day. After epidemiological evaluation, the vast majority of signals do not meet our criteria for follow-up investigation. During the study period, we followed up on 205 signals detected by our system, an average of 1 investigation every 3.7 days

(representing approximately 3.7% of all positive signals). One hundred ninety six (95.6%) investigations were initiated when one or more patients presented to an ED with chief complaints or diagnoses suggestive of a notifiable condition, representing a total of 217 patients. The remaining 9 investigations were initiated based on detection of a signal corresponding to a statistically significant increase over expected counts; subjective observation of an increase in a temporal trend above expected levels; or discrete geographic clustering of cases as determined by a scan statistic or subjective evaluation. We were able to confirm the existence of a notifiable condition in 61/217 patients for which we requested follow-up (positive predictive value 28.1%); 26/61 reports were not otherwise reported to Public Health. These reports were primarily identified using chief complaint alone (n=23) and included the following conditions: animal bites (n=4); administration of rabies post-exposure prophylaxis (n=12); malaria (n=1); pertussis (one patient, plus a cluster of 4 cases); giardiasis (n=2); hemolytic uremic syndrome (n=1); and tetanus (n=1). No events of public health significance could be confirmed on the basis of investigations that were initiated when an algorithm signaled an alarm.

## CONCLUSIONS

Over a period of 1.5 years, only 3.7% of all signals met our criteria for follow-up investigation. We were not able to confirm any events of public health significance based upon statistical alarms or subjectively high syndrome counts. Furthermore, only a small fraction of patients we investigated as suspicious for having a notifiable condition were confirmed (28.1%); 42.6% of these patients were not otherwise reported to our health department as required by law. The primary limitation of this study is that we did not analyze signals that didn't result in follow-up. Also, because the predictive value of a system is dependent upon the prevalence of disease, these results may differ in other settings.

## REFERENCES

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