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# Utility of a Syndromic Surveillance System to Identify Disease Outbreaks with Reportable Disease Data

Carrie Eggers*, Janet Hamilton and Richard Hopkins

Florida Department of Health, Tallahassee, FL, USA

## Introduction

In light of recent communicable disease outbreaks, the ability of Florida Department of Health's (FDOH) syndromic surveillance system, ESSENCE-FL, to identify emergent disease outbreaks using reportable disease data and algorithms originally designed for emergency department chief complaint data was examined. Preliminary work on this analysis presented last year was recently updated and expanded to include additional diseases, further levels of locale, and detector algorithm comparisons. Cases are entered into Merlin, the Bureau of Epidemiology's secure web-based reporting and epidemiologic analysis system, by all 67 county health departments and the de-identified case data are sent hourly to ESSENCE-FL. These data are then available for ad hoc queries, allowing users to observe unusual changes in disease activity and assist in timely identification of infectious disease outbreaks. Based on system algorithms, weekly case tallies are assigned an increasing intensity awareness status from normal to alert and are monitored by county and state epidemiologists to guide timely disease control efforts, but may not by themselves be definitive actionable information.

## Methods

Previous collaboration with the Johns Hopkins University Applied Physics Lab produced a novel data module in ESSENCE-FL to integrate Merlin reportable disease data. Within the ESSENCE-FL query portal, the Merlin Reportable Diseases Data Source was selected and all confirmed, probable and suspect cases of specified diseases during 2012 were selected. Diseases included Pertussis, Varicella, Salmonellosis, Shigellosis, Legionellosis, Campylobacteriosis, Lyme Disease, Dengue Fever, West Nile Virus and Ciguatera. The Weighted Moving Average (EWMA 1.2) detector was used to classify weekly case count statuses as normal or if abnormal, as warning or alert level. These statuses were then compared with reportable disease cases designated as outbreak-associated in Merlin, with outbreaks reported in Merlin's fully integrated outbreak reporting module, and with outbreak reports submitted to EpiCom, Florida's health alert network. An ESSENCE-FL generated warning or alert was considered valid if a corresponding outbreak was reported via these methods.

## Results

Examination of 2012 surveillance data for the diseases Pertussis, Varicella, Salmonellosis, Campylobacteriosis, Dengue Fever, West Nile Virus and Ciguatera, indicated a total of 183 weeks of outbreak activity statewide, with 84 warnings or alerts generated by ESSENCE-FL. The median detection sensitivity of known outbreak activity was 36% (range 20-79%); while the median positive predictive value (PPV) of outbreak events was 86% (range 55-100%). Relative risk for all considered diseases ranged from 1.4 for Salmonellosis to 10.0 for West Nile Virus (median 1.6), signifying the likelihood for outbreak activity for those weeks with a warning or alert versus those weeks with a normal status. PPV was highest for Ciguatera, Pertussis and Salmonellosis at 100%, while the highest sensitivity was shown for West Nile Virus (79%) and Salmonellosis (49%). All diseases except Dengue Fever showed significant associations between known statewide outbreak activity and ESSENCE-FL alerts.

## Conclusions

Common diseases tended to have a higher PPV and less sensitivity than rare diseases. In addition, PPV appeared highest with non-seasonal diseases, while sensitivity was generally higher with seasonal diseases. Florida does not currently have a requirement for documenting all outbreaks in a single statewide system, so it is common that outbreaks occur and are known to an individual county but are not necessarily noticed at the state-level. There is a significant association between outbreak activity and ESSENCE-FL generated alerts, and while the overall sensitivity is not exceptional, the PPV is consistently high. Although all outbreak activity may not be recognized at the state level, when an alert is generated from reportable disease data, it is a useful catalyst for further investigation.

## Keywords

Syndromic Surveillance; Outbreak; Evaluation

## References

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*Carrie Eggers
E-mail: CEggers@cdc.gov