

# Detection of Enteric Disease Epidemics Using a Diarrhea-specific Category

Loren E. Shaffer, PhD, MPH<sup>1</sup>, Robert T. Rolfs, MD<sup>2</sup>, Renee M. Calanan, PhD<sup>2,3</sup>

<sup>1</sup>Health Monitoring Systems, Pittsburgh, PA, <sup>2</sup>Utah Department of Health, Salt Lake City, UT,

<sup>3</sup>Epidemic Intelligence Service, Centers for Disease Control and Prevention, Atlanta, GA

## OBJECTIVE

The objective of this study was to evaluate the potential for improved detection of enteric disease epidemics using a classification category based on variations of diarrhea appearing in the chief complaints from emergency department and urgent care facility visits.

## BACKGROUND

The Utah Department of Health documented a single epidemic of cryptosporidiosis in Utah during 2007. Seven hundred eleven laboratory-confirmed cases were reported in Salt Lake County, Utah from July 27 through December 18. Illness onset date was available for 86% (611 of 711) of patients and ranged from May 30 through November 11. Approximately 32% (224 of 691) of patients sought care in area emergency departments or urgent care facilities, and 8.5% (50 of 590 with data available) of patients required hospitalization. Sixty-one percent (432 of 711) of patients were less than 13 years of age. Of 381 patients with data available on symptoms, nearly all (99%, 378) reported diarrhea. Other commonly reported symptoms included vomiting (57%, 218), abdominal pain (51%, 196), and nausea (44%, 168).

Syndromic surveillance methods in use in Utah in 2007 did not detect this outbreak. These methods included surveillance of a gastrointestinal syndrome category among chief complaints from all available emergency department and urgent care visits (all ages and both genders). A statewide increase in laboratory-confirmed cryptosporidiosis case reports was detected on July 26 (Salt Lake County's first case report was received on July 27).

## METHODS

The authors studied the time series of two categories of chief complaints from emergency department or urgent care facility visits of Salt Lake County, Utah residents from January 1–December 31, 2007. The gastrointestinal category (GC), originally designed for use by the Real-time Outbreak and Disease Surveillance system, included “all visits with complaints of pain or cramps anywhere in the abdomen, nausea, vomiting, diarrhea, and abdominal distension or swelling”[1]. The diarrhea category (DC) contained only spelling and expression conventions of diarrhea (e.g. “loose stool”, “runs”, “dirhea”). The GC and DC time series were compared visually to the reported cases and a Pearson correlation analysis was conducted. Standard deviation from the overall mean

value of daily counts was compared to the GC and DC time series (Fig. 1). Occurrence of deviations (exceeding a threshold based on CuSum and Exponentially Weighted Moving Average [EWMA] algorithms) around the time of the known epidemic was assessed using age-specific counts.

## RESULTS

There were similar changes in DC and GC time series consistent with known cases. GC appeared to have a more pronounced seasonal pattern. Standard deviation of DC (7.39) was notably less than GC (18.45). Correlation analysis indicated a stronger relationship between known outbreak cases and DC ( $r=0.68$ ) compared with GC ( $r=0.48$ ). Increases in persons seeking care at an emergency department or urgent care facility with complaints of diarrhea during the time of the epidemic were detectable earlier using DC compared with GC (EWMA=3 weeks, CuSum=7 weeks). Detection earlier than traditional reporting methods was possible only using DC with age-specific groups.

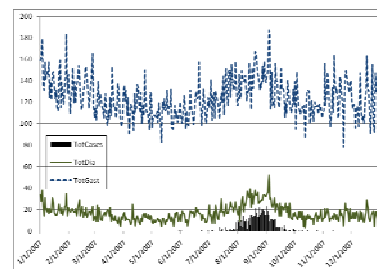


Figure 1. Daily gastrointestinal and diarrhea category counts from emergency department and urgent care facility visits and cases of cryptosporidiosis by onset date — Salt Lake County, Utah, 2007.

## CONCLUSIONS

Results of this preliminary investigation indicate that a diarrhea category provides a more timely method to detect outbreaks compared to traditional reporting methods or syndrome category. Categories comprised of symptoms might improve outbreak detection by limiting noise and false alerts created by using less specific syndrome categories when disease presents predominantly with one symptom. While this method is not appropriate for all health events of interest, the value to epidemics of enteric disease is promising.

## REFERENCES

[1] Chapman WW, Christensen LM, Wagner MM, et al. Classifying free-text triage chief complaints into syndromic categories with natural language processing. *Artif Intell Med.* 2005;33(1):31-40.

Further Information: Loren Shaffer, [loren.shaffer@hmsinc.com](mailto:loren.shaffer@hmsinc.com)