

Detection of Enteric Disease Epidemics Using a Diarrhea-specific Category

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OBJECTIVE – Evaluate the potential for more timely detection of enteric disease epidemics using a classification category based on spelling and expression conventions of diarrhea appearing in the chief complaints from emergency department and urgent care visits compared to 1) traditional detection methods based on surveillance of laboratory test report data and 2) a classification category based on any gastrointestinal symptoms appearing in the chief complaints from emergency department and urgent care 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).

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METHODS

The authors studied the time series created from the daily counts 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”). First, the GC and DC time series were compared visually to the reported cases time series and a Pearson correlation analysis was conducted. The standard deviation from the overall mean value of daily counts was compared between the GC and DC time series (Fig. 1). Finally, 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 (Fig. 2).

RESULTS

Summary of Analysis

- $\sigma_{GC} = 18.5$
 - $\sigma_{DC} = 7.4$
- Variability of GC time series is nearly three times that of DC time series.
- $r^2_{GC} = 0.48$
 - $r^2_{DC} = 0.68$
- DC time series is more closely correlated to the reported cases time series

Earlier detection of epidemic, compared to traditional reporting, was possible with DC and GC when age-specific categories were analyzed using an EWMA method.

Figure 1. Comparison of Gastrointestinal Syndrome and Diarrhea Symptom Category emergency department registrations to reported cases of epidemic related cryptosporidiosis in Salt Lake County, Utah, 2007.

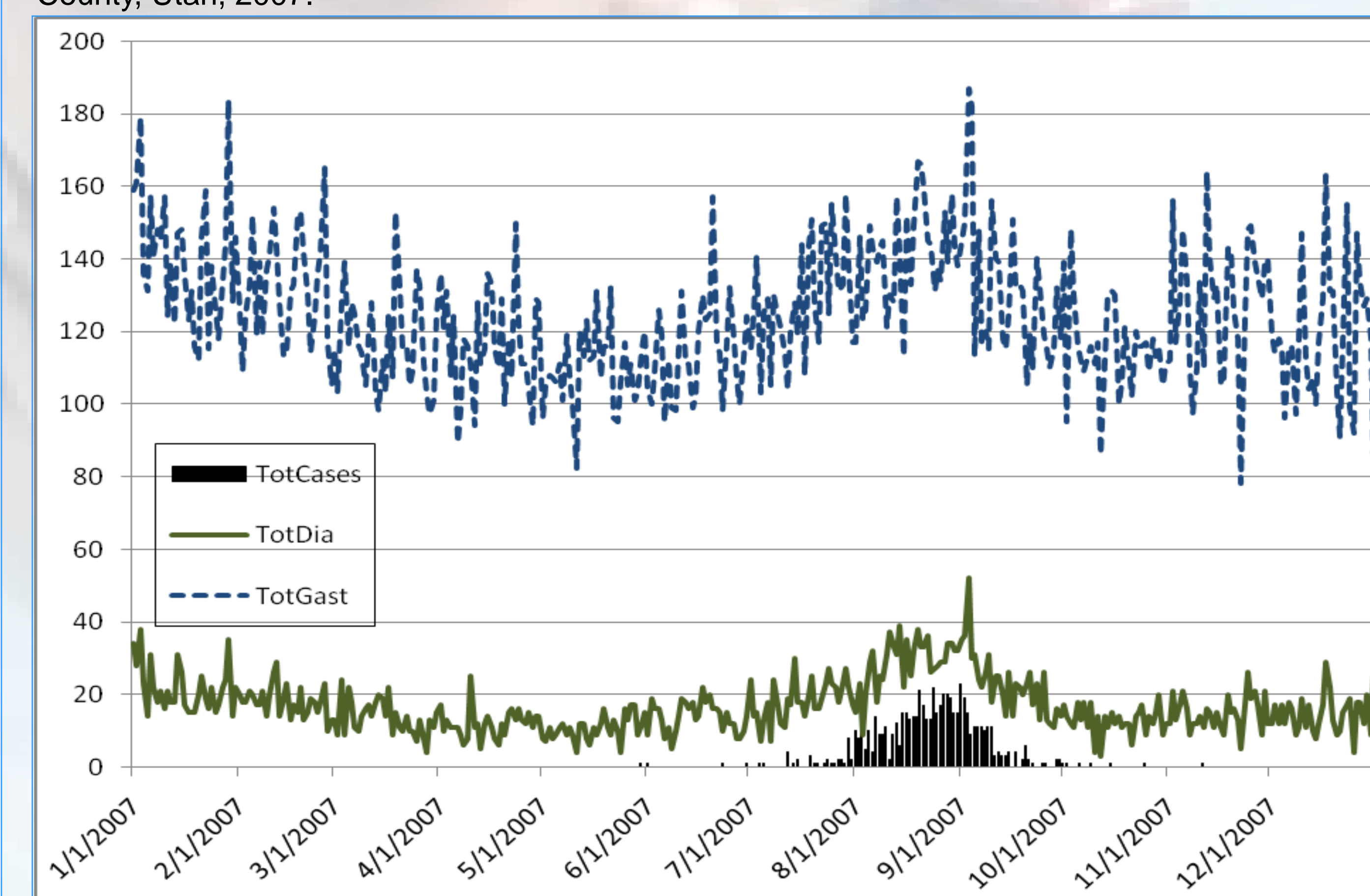
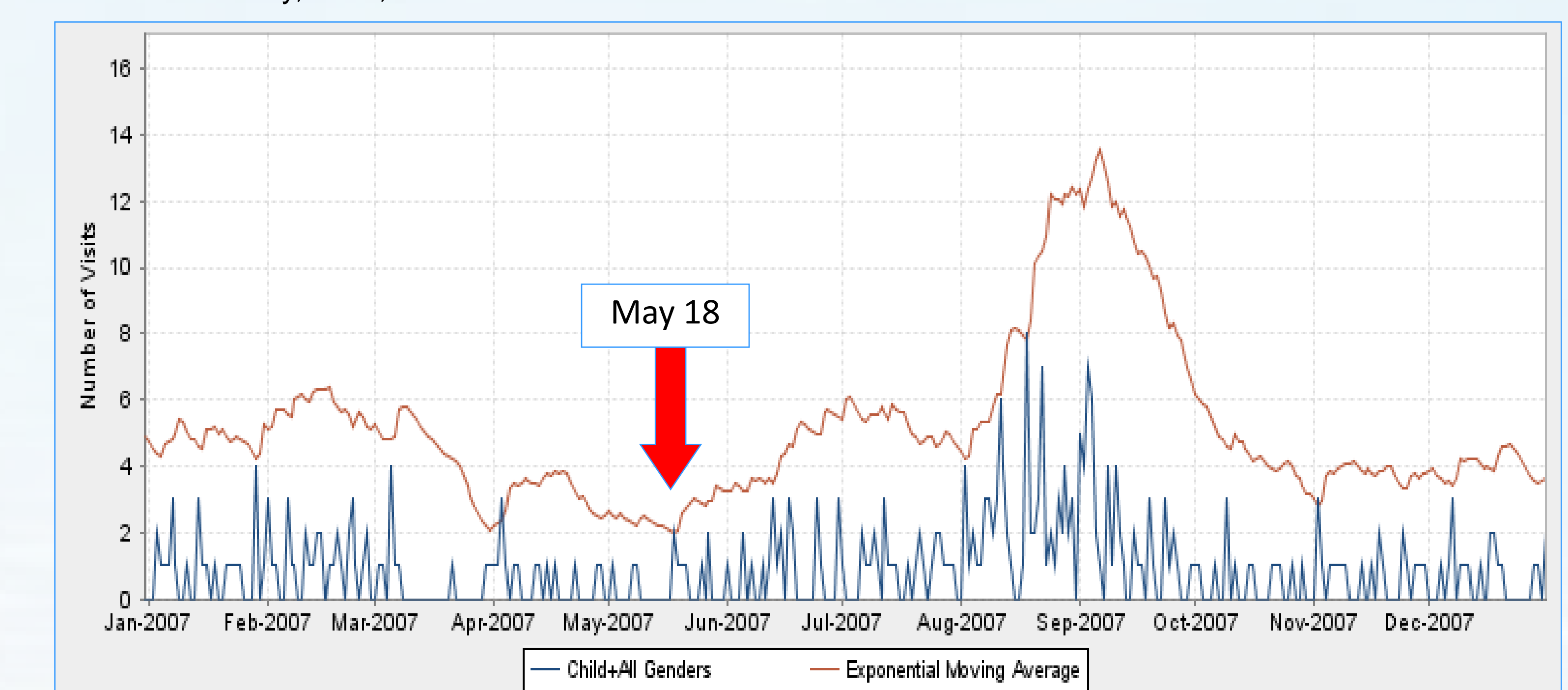
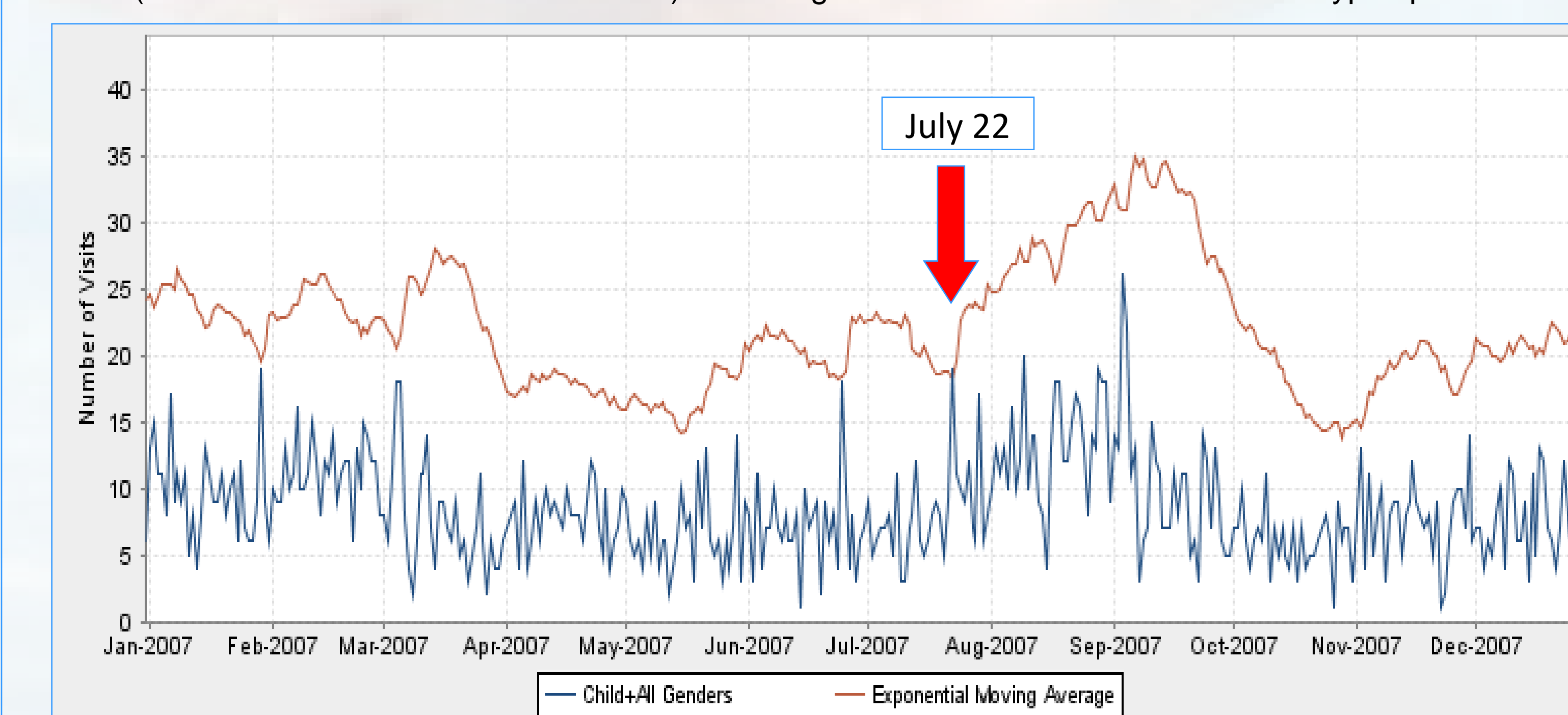


Figure 2. Examination of age-specific (6 to 12 years) Gastrointestinal Syndrome (left) and Diarrhea Symptom (right) emergency department registration time series using a Exponentially Weighted Moving Average detection method (threshold = 4.08 standard deviations) indicating dates that would have indicated cryptosporidiosis epidemic for Salt Lake County, Utah, 2007.



CONCLUSIONS

Syndromic surveillance of chief complaints from emergency department and urgent care visits using a category of spelling and expression conventions of diarrhea provided for more timely epidemic detection than either traditional disease reporting or similar syndromic surveillance using a category of gastrointestinal syndrome when counts were stratified by age group. Categories comprised of symptoms rather than syndromes might improve epidemic detection by limiting noise and the false detections resulting from reduced specificity when the 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.

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