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Emerging Health Threats Journal 2011, **4**:s14. **doi:** 10.3134/ehtj.10.014

www.eht-journal.org

ABSTRACT

911 and EMS data for detection of drinking water contamination

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Objective
This paper describes the design, application and use of 911 and Emergency Medical Services (EMS) data in a drinking water contamination warning system.[1]

Introduction
The Public Health Surveillance (PHS) component (one of five monitoring and surveillance components deployed in the Cincinnati drinking water contamination warning system) functions to detect public health incidents resulting from exposure to toxic chemicals that produce a rapid onset of symptoms. Within the PHS component, four data streams were monitored: 911 calls, Emergency Medical Services (EMS) logs, Local Poison Control Center call data, as well as Emergency Department data (via EpiCenter). The focus of this paper centers on the 911 and EMS surveillance tools. The 911 data is dependent on information provided by the caller and the information entered by the dispatcher. EMS data, on the other hand, is recorded by a medical professional, and although not provided as rapidly as 911 data, provides more detailed information. The data included in 911 and EMS alerts, when utilized together, can provide timely and beneficial information during investigation of a possible drinking water contamination incident.

Methods
911 calls are captured electronically via a computer aided dispatch system. Calls are classified into standard incident code categories based on information a caller reports to the 911 dispatcher. Call data that meets established filtering criteria is transferred from the Cincinnati Fire Department's (CFD) source database to a dedicated application database at the local water utility. Automated surveillance once every hour using the SaTScan (SaTScan Software, Boston, MA, USA) space-time scan statistics searches for unusual clusters of 911 calls assigned to selected symptom categories. If an unusual cluster is detected, an alarm is generated.

CFD emergency medical technicians (EMT) collect EMS run information using a wireless tablet, and capture patient data such as age, gender, vital signs, chief medical complaint, EMT medical observations, and incident zip code. EMS run data are transferred from CFD's source database to a dedicated application database at the local water utility. The EMT's medical observations are categorized into syndromes and analyzed by the CDC's Early Aberration Reporting System (EARS) software (Early Aberration Reporting System, Atlanta, GA, USA). Surveillance of EMS data occurs on an hourly basis. If unusual conditions are detected in the EMS runs, an alarm is generated.

For both 911 and EMS, once an alarm is generated, an email notification is sent to the local public health partners who have primary responsibility to lead the ensuing investigation.

Results
Alarms from the 911 and EMS surveillance tools were investigated by the public health partners. Although no true water contamination event occurred during the study, a handful of public health events were detected. Various drills and exercises allowed the public health partners and local water utility to investigate alerts, which suggested possible water contamination, and to gain a better understanding of the surveillance tools' capabilities. The 911 and EMS alarm occurrence was tracked during the study, and it was determined that there was a need to modify the existing alerting criteria for each tool given the high rate of false alarm occurrence. Upon implementation of additional alerting restrictions, alarm frequency decreased significantly and was accepted as more beneficial to detecting a waterborne public health event.

Conclusions
The results of the pilot in Cincinnati demonstrate that 911 and EMS surveillance tools can produce timely and beneficial data in detecting a drinking water contamination incident, and provide dual use benefits for detection of other non-water related public health outbreaks.

Acknowledgements

This paper was presented as an oral presentation at the 2010 International Society for Disease Surveillance Conference, held in Park City, UT, USA on 1–2 December 2010.

Reference

1 US EPA. Water security initiative: Cincinnati pilot post-implementation system status report, 2008 EPA 817-R-08-004.