

# Utility of Syndromic Surveillance for Investigating Morbidity Resulting from a Severe Weather Event

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## OBJECTIVE

We evaluated emergency department (ED) and emergency medical services (EMS) data for describing an outbreak of carbon monoxide (CO) poisoning following a windstorm, and determined whether loss of power was followed by an increase in other health conditions.

## BACKGROUND

On 12/14/06, a windstorm in western Washington caused 4 million residents to lose power; within 24 hours, a surge in patients presented to EDs with CO poisoning. As previously described [1], records of all patients presenting to King County (KC) EDs with CO poisoning between 12/15/06 to 12/24/06 (n=279) were abstracted, of which 249 met the case definition and eligibility requirements. We attempted to identify each of the 249 confirmed cases of CO poisoning in our syndromic ED data set by comparing the hospital name, date, time, age, sex, zip code, chief complaint, and diagnoses across the two data sets. We designated each record as an exact match, likely match, possible match, or unmatched on the basis of the available fields.

## METHODS

Calls to 9-1-1 are triaged by KC EMS/Medic One, with the exception of Seattle, which triages calls through the Seattle Fire Department (SFD). For the period 1/1/04 to 12/31/07, SFD routinely transmitted data to Public Health, including the date and time of calls, dispatch codes, and the age and sex of patients, if available. EMS/Medic One provided historical data from incident report forms that were completed on scene during this same time period, including geocoded incident location, chief complaint, patient outcome, date of symptom onset, severity, and selected biometric measurements. We classified chief complaints and diagnoses into the following categories: dizziness, nausea, headache, vomiting, loss of consciousness (LOC), shortness of breath (SOB), and CO-related illness. We excluded complaints unrelated to CO poisoning, such as alcohol or drug toxicity. Puget Sound Energy provided the duration of power outage by feeder station; we mapped each station to the zip codes served. Temporal analytical methods included signal-to-noise (SNR) and correlation analyses to select effective EMS record groupings and compare them to ED syndromes. Scan statistics were applied to identify clusters of CO poisoning cases.

## RESULTS

During December 15-24, 2006, our syndromic surveillance system captured 16,982 ED visits. Most of the 169 ED patients with CO-related illness resided in South (29%) or East (21%) King County. Of the 249 CO cases confirmed by chart review, 189 (75.9%) were identified in the syndromic surveillance data as exact matches; 18 (7.2%) were likely matches; 12 (4.8%) were possible matches; and 30 (12.1%) could not be matched on the basis of the available fields. Excluding the unmatched records, 75.8% (n=166/219) had a chief complaint or diagnosis containing our CO search terms. Further excluding records with a missing chief complaint (n=13), the most common reasons patients presented to EDs included specific mention of CO poisoning or exposure (123/206, 59.7%), followed by headache (27/206, 13.1%), nausea or vomiting (17/206, 8.3%), smoke inhalation (17/206, 8.3%), and dizziness (11/206, 5.3%). An inhalation/gas/smoke/etc. category of EMS records detected an increase in CO-related calls on the first day after the storm with an SNR of nearly 50. Significant spatiotemporal clusters of those calls were found during the following week. Clustered regions included zip codes suffering widespread power outage. Weak temporal GI signals, possibly resulting from ingestion of food spoiled by lack of refrigeration, were detected in the ED data but not in the EMS data; GI clustering was not detected.

## CONCLUSIONS

Data from this evaluation support the value of ED data for surveillance after natural disasters. The EMS data are useful for both primary detection of events involving respiratory and neurological symptoms and corroboration of early ED signals. Utility for GI-related events is limited by nonspecificity of EMS records. If routinely available to the health department, the power outage and Poison Control Center call data could be useful for characterizing ongoing crises and for understanding statistical signals. The cluster results in the week of the storm showed value for tracking a threat on a modest spatial scale.

## REFERENCES

[1] Baer A, Gulati R, Kwan-Gett T, Duchin J. Performance of a syndromic surveillance system for detecting carbon monoxide poisoning following a severe windstorm. *Advances in Disease Surveillance*. 2007;4:232.

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