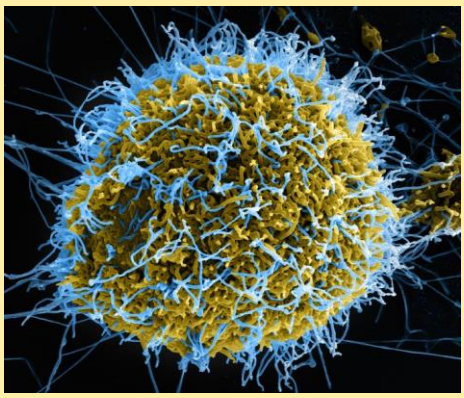


Human cell infected with Ebola

Lessons Learned

After the first case of Ebola Virus Disease was confirmed in Dallas–Fort Worth, Texas, syndromic surveillance data showed an increase in emergency department (ED) visits—including visits for symptoms that *did not* match the disease profile.

- ***Syndromic data are useful for monitoring upticks in ED visits and characterizing the disease.*** Syndromic data (similar symptoms grouped into categories) can be used to characterize a disease *before* labs submit reports that confirm the disease. Early notification can lead to specialized testing among at-risk populations. These data can help set apart the "worried well," who may unnecessarily overwhelm an ED, from people with symptoms similar to (or vastly different from) symptoms associated with the disease.
- ***An uptick in ED visits by the "worried well" can inform those who communicate with targeted populations and who provide technical assistance to news media.*** Accurate, timely reporting can reduce public fears that lead to needless ED visits.
- ***Syndromic surveillance data improves situational awareness.*** *Situational awareness* is the term used to describe a heightened awareness of populations seeking healthcare services, their symptoms, and geographic areas with an uptick in healthcare services. Syndromic data can also be used to inform and monitor the effectiveness of interventions and communication strategies.

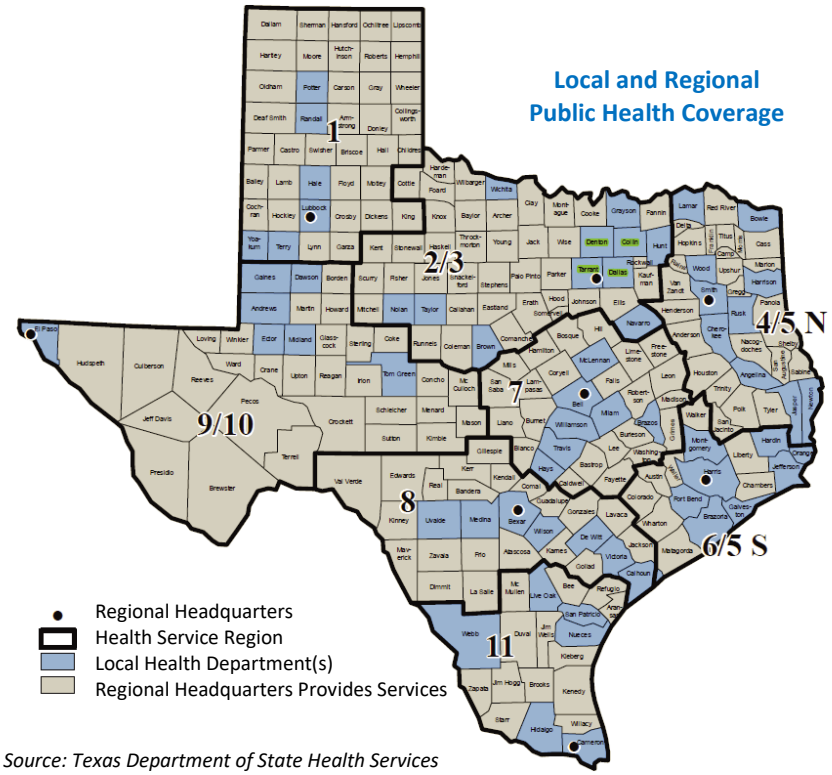
Syndromic Surveillance Shows Rise in Emergency Department Visits after Case of Ebola

Public Health Problem

The first Ebola virus case on American soil was confirmed September 30, 2014, in a 45-year-old man. He had entered the country on September 20, 2014, from Liberia. Feeling ill, he visited a Dallas, Texas, hospital 5 days later where he was released but subsequently returned September 28 gravely ill. These events created unprecedented media attention and exacerbated fears of a widespread Ebola outbreak in the United States. A study using syndromic surveillance data was conducted to examine whether ED visits changed among metropolitan Dallas–Fort Worth (DFW), Texas, residents after the case was reported.

Actions Taken

Methods: This study used the Texas Health Service Region 2/3 syndromic surveillance data and associated ESSENCE analytics through the North Texas Syndromic Surveillance System from July 21, 2013, to July 22, 2015. Focusing on the metropolitan DFW area, interrupted time series analyses were conducted. The analyses used segmented regression models with autoregressive errors of daily ED visits, overall and for several chief complaints, including fever and fever with gastrointestinal distress (GI Fever), and date that the first case of Ebola virus was confirmed (the "event"). Visits and visit rates by chief complaint before and after the event were analyzed, and absolute and relative effects of the event were estimated.



Source: Texas Department of State Health Services

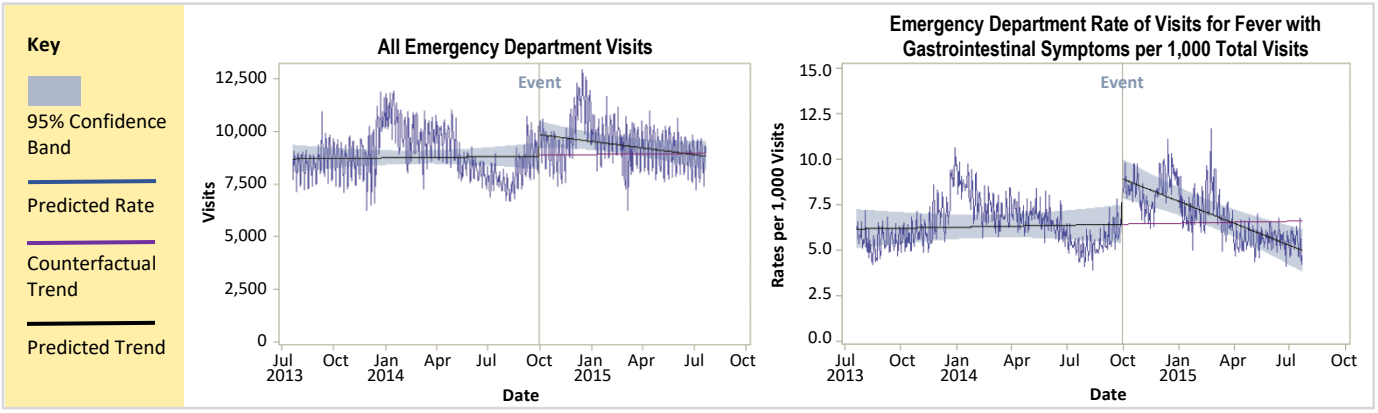
Table 1. Estimates of Absolute and Relative Effects of Ebola Virus Disease Case in Metropolitan Dallas–Fort Worth, Texas, on Daily Emergency Department Visits, July 21, 2013–July 22, 2015

	All Visits per Day						Rate* of Fever with Gastrointestinal Symptoms					
	Absolute Change from Baseline			Percentage Change from Baseline			Absolute Change from Baseline			Percentage Change from Baseline		
	Estimate	95% CI**		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Immediate Effect	1,022.97	796.98	1,252.83	11.77	9.22	14.36	2.48	2.11	2.86	40.24	34.43	46.03
Effect at 1 Week Post Event	996.97	775.28	1,224.40	11.32	8.71	14.05	2.39	2.02	2.76	37.09	30.66	44.00
Effect at 2 Weeks Post Event	970.96	752.69	1,195.53	11.02	8.45	13.73	2.29	1.93	2.65	35.56	29.19	42.38

* Rate = Visit rate per 1,000 total visits

** 95% confidence intervals (CI) are estimated using the bootstrap method of Zhang et al, 2009.

Figure 1. Predicted Visits from Interrupted Time Series (ITS) Models of Daily Emergency Department Visits and Visit Rates Compared to Counterfactual, Metropolitan Dallas–Fort Worth, Texas, July 21, 2013–July 22, 2015



Note that the ITS model predicts visits, rates, and structural trend. The counterfactual assumption is that no event interrupts the time series.
Event = Reference line at September 30, 2014, indicates date of first case of Ebola Virus Disease diagnosed in Dallas, Texas. Predicted trend not significantly different from counterfactual trend as of January 22, 2015, for All Visits and as of March 20, 2015, for Fever with Gastrointestinal Symptoms Visit Rates.
95% confidence band represents confidence interval around predicted structural trend.

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The National Syndromic Surveillance Program (NSSP) BioSense Platform is a product of the Centers for Disease Control and Prevention (CDC). The findings and outcomes described in this NSSP success story are those of the authors and do not necessarily represent the official position of CDC.

This success story shows how NSSP
- Improves Data Representativeness
- Improves Data Quality, Timeliness, and Use
- ✓ Strengthens Syndromic Surveillance Practice
- ✓ Informs Public Health Action or Response

Actions Taken, continued

Results of analyses: Interrupted time series results (figure 1) indicated the event was highly significant for ED visits overall (p=0.0147) and for the rate of GI Fever visits (p<0.0001). Immediately after September 30, 2014, an increase was observed in total ED visits of 1,023 visits per day (95% CI: 797, 1,253) (table 1). This is an increase of 11.77% (95% CI: 9.22%, 14.36%) in daily ED visits overall. GI Fever visits increased by 40% (95% CI: 34.43%, 46.03%), but this amounted to an increase of about 2 to 3 visits per day.

Total ED visits remained significantly above baseline, even accounting for seasonal surge periods related to the cold and flu season, until January 22, 2015. The total impact of the Ebola Virus Disease (EVD) case on total ED visits from September 30, 2014, through January 22, 2015, was 95,690 (95% CI: 69,185, 116,202) *excess* visits. The total impact of the EVD case on GI Fever visits, which returned to baseline by March 20, 2015, was 2,151 (95% CI: 2055, 2247) excess visits attributable to the fatal EVD case.

Outcome

Immediately after the EVD case was confirmed, ED visits in metropolitan DFW increased significantly—both within and outside the symptom profile for EVD. Health officials determined most increases were *not* due to EVD symptoms because the people seeking care had no fever, had not reported travel, and had not been exposed to the man confirmed to have EVD. ED visits remained elevated for some time even after adjusting for seasonality both within symptom-specific chief complaints and overall.

A poster and abstract for the poster and paper were presented in February 2017 at the Texas Public Health Association and the National Association of County and City Health Officials (NACCHO) Preparedness Summit. Findings were based on the use of ESSENCE in the study of emergency room surge due to the Ebola case.