A Spatial and Temporal Investigation of Medical Surge in Dallas-Fort Worth during Hurricane Harvey, Texas 2017

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BACKGROUND

Hurricane Harvey made landfall in Texas on August 25, 2017, resulting in 88 fatalities and more than $125 billion in damages to infrastructure. In Houston, flooding created a toxic mix of chemicals, sewage, biohazards and 8 million cubic yards of garbage. The level of biohazard exposure, as well as injuries from trauma among persons residing in affected areas, was widespread and likely contributed to increases in emergency department (ED) visits in Houston as well as cities that received persons evacuating from the hurricane.

PURPOSE

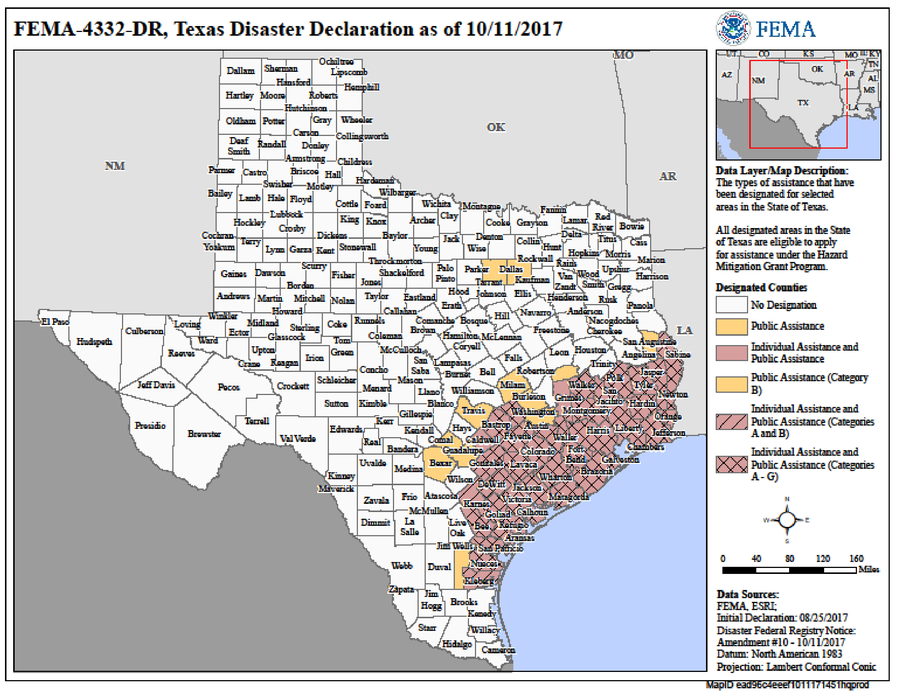
To investigate medical surge associated with Hurricane Harvey in Dallas-Fort Worth (DFW) metroplex emergency departments. Evacuees from 60 Texas counties with disaster declarations sought care outside the storm impact zone, many in DFW. We examined spatial and temporal variation in ED visits to DFW hospitals attributable to the storm.

METHODS

We analyzed ED patient visit data in ESSENCE from the DFW area, which received evacuees from 60 counties with emergency declarations due to the storm.

- Data is sourced from the Tarrant County North Texas Syndromic Surveillance Region 2/3 system
- EWMA/regression algorithm was done on data from August 6 to September 23, 2017 to identify statistically significant surge.
- Data from three 11 day periods before, during, and after the storm were visualized to characterize magnitude, duration, and spatial variation of medical surge associated with Hurricane Harvey.

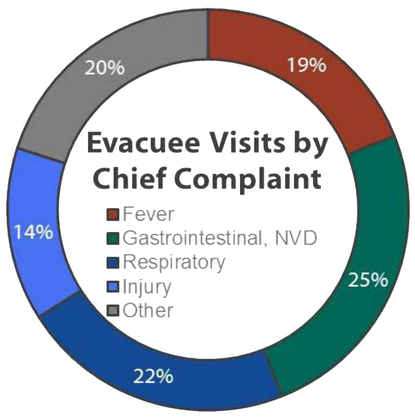
Texas County-level Disaster Declarations due to Hurricane Harvey, 2017

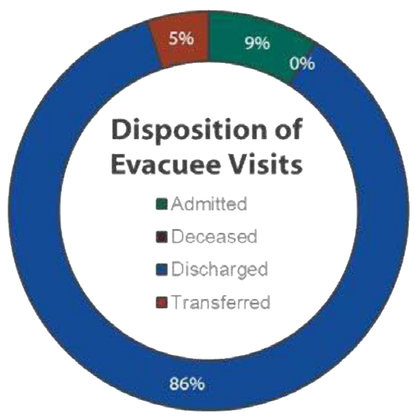


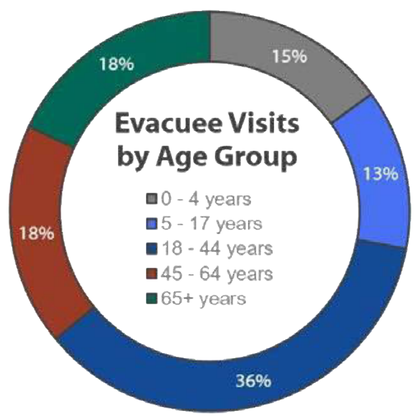
RESULTS

Between 08/25/2017 and 09/07/2017:

- ED visits in the DFW area increased somewhat
  - About 4% per day (range: 0.3%, 12.0%)
  - ~ 4,400 excess total visits during the impact period
- ED visits by evacuees increased substantially
  - ~200% per day (range: 21%, 500%)
  - 875 visits during the impact period (~600 excess visits)
  - Increased visits across all age groups
  - 40% of visits were from Harris County residents
  - 25% of visits for gastrointestinal complaints
  - Significant increase in nausea-vomiting-diarrhea (NVD) visits

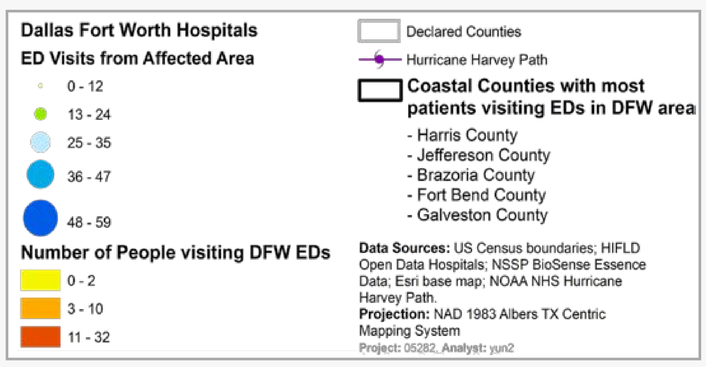


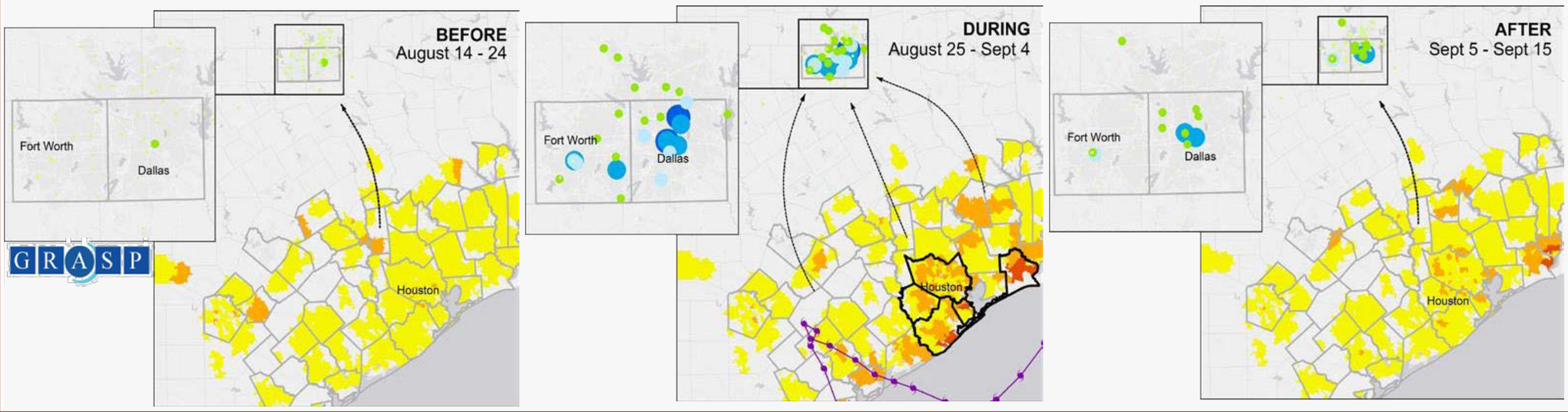




Hospital Surge in Dallas-Fort Worth from Coastal Counties with Emergency Declarations, Hurricane Harvey 2017

The maps visually characterize surge in evacuees presenting for care at emergency departments in DFW area. "Evacuees" refers to people from 60 Texas counties with emergency declarations due to Hurricane Harvey. The yellow to dark orange categories represent number of ED visits in DFW hospitals from people with residential zip codes in emergency declared counties. We see a large number of visits in evacuees from the Houston area during the storm. The green to blue graduated circles represent the number of ED visits in DFW hospitals from people who reside in Texas counties with emergency declarations. We observe a strong increase in visits due to evacuees during the storm impact period. While most hospitals in the area experienced significant surge, at least 10 hospitals experienced a 600% ED visit surge from evacuees, two of which experienced >1,000% surge.





Public Health Recommendations

- Disaster preparedness efforts should be coordinated across geographical boundaries to account for population mobility during an event.
- Hospitals within 1 to 4 hours driving distance from major disasters should consider preparing in advance of the storm for a medical surge.
- Public health agencies should improve surveillance methods to track disaster morbidity and mortality associated with evacuees.
- Receiving area health departments should establish disease investigation dashboards to correlate syndromes with notifiable diseases and specific causes (e.g., NVD) to more rapidly address morbidity and mortality.

Discussion

- This study highlights the utility of syndromic surveillance data for conducting timely analyses associated with disasters.
- Results demonstrate the use of spatial and temporal methods for detecting emergency department surges associated with disasters.
- Results statistically and visually demonstrate the expansive human impact outside the immediate affected area of a natural disaster.

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