Intelligent Surge

IMPROVING HEALTHCARE PREPAREDNESS IN TIMES OF DISASTER

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Problem Statement

“Disasters are often unexpected and evacuees need to know where to go and how to get out when these events take place. With the increasing frequency in disasters resulting in human displacement, determining regionally where individuals decide to flee to seek shelter during disasters is critical to assure appropriate healthcare resource allocation and evacuee support.”
Intelligent Surge
“Draw an area on a map and tell me how long it will take to evacuate the people there”
ESSENCE
Electronic Surveillance System for the Early Notification of Community-based Epidemics

Data Collection & Management

Analyze / Detect

Web Visualization

Investigate & Respond

Data

ESSENCE Locations

- USA
- Region, County, City
- Missouri & St. Louis, IL
- Aggregate NCR
- Tri-County, CO
- Stanislaus County, CA
- Santa Clara County, CA
- Cook County, IL
- Tarrant County, TX
- Oklahoma City / Tulsa, OK
- Boston, MA
- Houston, TX

Veterans Affairs
DoD
CDC
National Syndromic Surveillance Program

Query Interface

Time Series

Customizable Reports & Dashboards

GIS Maps

Detector Results
“Draw an area on a map and tell me how long it will take to evacuate the people there”

“How do people behave when they are sick?”

“During an evacuation, what medical resources will we need and where?”
IRMA Background

Miami – Dade County

Population: 2.275 Million

IRMA: Landfall on 9/10/2017 in Florida (Cat 4 -> Cat 3)

Florida Fatalities: 84 in storm-related incidents (drowning, trauma, carbon monoxide poisoning)

Damage: $64.76 Billion
ESSENCE Analysis

• Miami-Dade county residents seen in larger than normal numbers outside FL between 9/7/2017 – 9/15/2017

• The data showed 4 major paths:
  • West Path (Florida Panhandle, Alabama, Mississippi, Louisiana, Texas)
  • Central Path (Georgia, Tennessee, Kentucky)
  • East Path (South Carolina, North Carolina, Virginia, District of Columbia)
  • Flights / Major Cities (Illinois, New York, New Jersey, California)
ESSENCE Analysis

- Syndromic Analysis showed normal stratification of illness
  - Fever
  - Gastrointestinal
  - Respiratory
  - Injury
  - Other

- Sub-Syndrome Analysis showed normal stratification of illness
  - Cough / Sore Throat / Difficulty Breathing
  - Fever / Chills
  - Cuts / Falls
  - Abdominal Pain / Nausea / Vomiting / Diarrhea
  - Motor Vehicle Accident
Scenario

Hurricane IRMA

Miami-Dade County Evacuation

2.275 K Population

38% Evacuation Rate

866 K Evacuees

64.6 Hours to Evacuate to Northern FL End Points

3 End Points:
- West FL, AL
- Central GA
- East GA, SC, NC
Hour 10

West FL, AL: 4.5 K
Central GA: 7.7 K
East GA, SC, NC: 10.6 K
Hour 40

West FL, AL: 145 K
Central GA: 166 K
East GA, SC, NC: 212 K
Hour 65

West FL, AL: 231 K
Central GA: 361 K
East GA, SC, NC: 272 K
Conclusions

• Healthcare Seeking Behavior Model
  – Found that where individuals flee to is dependent on where the disaster hits
  – Either follow major roads (often to stay with family) or flock to nearest un-affected large city (something “to do” and resources present)
  – While the vast majority of evacuees visited neighboring state hospitals, there was an increase in distant states with large cities (NY, CA, IL)
  – Evacuees exhibit a wide variety of health issues while away from home. There is no dominant syndrome or sub-syndrome.
Conclusions

- Integrated Scenario with RTEPM & ESSENCE
  - Could apply approach to most major cities in the U.S.
  - Could be leveraged for emergency planning
  - Could be applied to any disaster situation that results in citizens evacuating

- RTEPM could be enhanced to produce hospital usage estimates based upon this scenario. Additional studies would need to be performed upon multiple scenarios to improve the precision of the models for other events.
Questions?

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