Response to a Fertilizer Plant Explosion in a Residential Area
Outline

- Background
- Objective
- Investigation Team
- Data Collection
- Results
- Lessons Learned
- Next Steps

Source: Associated Press
Fertilizer Plant Explosion
April 17, 2013

Adair Grain Inc.
City of West,
McLennan County, Texas

City of West
Population (2012): 2831
Area: 1.64 mi²
Magnitude of Explosion

Source: http://media.culturemap.com
Timeline

7:29 pm – Fire reported at West Fertilizer Plant
7:32 pm – West Volunteer Fire Department dispatched
7:38 pm – Fire Fighters arrive on scene

Evacuation of apartment complex
Lateral evacuation at nursing home

7:41 pm – Request for mutual aid from sister counties
7:51 pm – Explosion occurs

Source: Associated Press
Epidemiological Investigation

Objective
- Describe the extent and location of physical injuries and fatalities

Data collection tools
- Death certificates and medical examiner
- Hospitals, Urgent care clinics / Mobile Units
- Survivor interviews
- FEMA and TDEM, Maps

Outcomes
- Characteristics of fatalities and injuries

Investigation Team
- Waco McLennan Public Health District, Center for Disease Control, Texas
  Department of State Health Services
Epidemiology Investigation Team

Waco-McLennan County Public Health District
  – Hammad Akram, MD, MPH; Stephanie Alvey; Alicia Hernandez, RN, BSN, HACP; Debbi Parker, Kahler Stone, MPH

Texas DSHS Region 7
  – Bonnie Feldt, MPH; Sandi Henley, RN, CIC; Sharon Melville, MD, MPH, RMD

Texas DSHS Central Office
  – Tracy Haywood, BS; Kristi Metzger, PhD, MPH; Duke Ruktanonchai, MD; Judy Whitfield, David Zane, MS
Impact on Homes

- 142 destroyed
- 51 major damage
- 27 minor damage
Case Definition
Included all fatal and non-fatal injuries directly related to the fertilizer plant explosion

Source: Associated Press
Data Collection Tool

The investigation team developed a medical record data collection tool and a survivor survey. Multiple Wall maps and two mapbooks were also develop for use to aid in identifying the locations of injuries.

A two phase approach was used to collect data as described as:

1. Review and record medical records
2. Conduct survivor interviews
Grid X

• A significant portion of the community was evacuated
• Unknown number of buildings impacted
• Unknown number of injured and casualties

Source: Google Maps
Grid Y

- Nursing home - 200 yards from fertilizer plant
- Emergency plan to shelter in place executed after fire started
- 130 residents evacuated to local and regional care facilities

Source: Google Maps
Grid Z

• Operations, Staging, Responders and Sheltering
Medical Visits by Facility
Injury Mapbook

Data from medical records
  • Home address
  • Detail from history notes

Data from survivor interviews
  • Description of location at time of blast / injury

Data from FEMA
  • Damaged home address
  • Current home address
Street and Imagery
Wall maps
Analyses: Distance from Blast

- 172 persons directly injured by blast were geocoded
  - From medical records
  - From survivor interviews
- Relationship of distance from blast on types of injuries
How Many People were Injured?

5% Injury Fatality Rate

15 fatal injuries
15 fatal + 262 non-fatal injuries

7% Injury Attack Rate among West Residents

10 fatal + 197 non-fatal injuries
2831 population

288 people sought medical care

262 with physical injuries

197 were residents of West

NOTE: Preliminary Data
Proportion of Patients by Type of Injury

262 patients were treated for a physical injury

Abrasions / contusions
Laceration / penetrating trauma
Traumatic brain injury / concussion
Tinnitus / hearing problem
Eye injury
Inhalation injury
Sprain / strain
Fracture / dislocation
Blast injuries
Tympanic membrane rupture
Burn
Location at Time of Explosion

252 non-fatal injuries directly caused by explosion

- Inside*: 54% (138)
- Outside: 13% (33)
- In vehicle: 8% (20)
- Unknown: 24% (61)

* All 72 West Rest Haven residents that were injured were inside (53% of those inside)
### Approx. Distance from Blast for Persons Injured Directly by the Blast (n=252), by Admission Status

<table>
<thead>
<tr>
<th>Distance</th>
<th>Total N (%)</th>
<th>Admitted N (%)</th>
<th>Not admitted N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;500 ft.</td>
<td>9 (4%)</td>
<td>3 (5%)</td>
<td>6 (3%)</td>
</tr>
<tr>
<td>500-999 ft.</td>
<td>125 (50%)</td>
<td>47 (84%)</td>
<td>78 (40%)</td>
</tr>
<tr>
<td>1000-1499 ft.</td>
<td>18 (7%)</td>
<td>3 (5%)</td>
<td>15 (8%)</td>
</tr>
<tr>
<td>1500-1999 ft.</td>
<td>6 (2%)</td>
<td>0</td>
<td>6 (3%)</td>
</tr>
<tr>
<td>2000-2499 ft.</td>
<td>5 (2%)</td>
<td>0</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>2500-2999 ft.</td>
<td>1 (&lt;1%)</td>
<td>0</td>
<td>1 (&lt;1%)</td>
</tr>
<tr>
<td>3000-3499 ft.</td>
<td>3 (1%)</td>
<td>0</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>&gt;=3500 ft.</td>
<td>5 (2%)</td>
<td>0</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>80 (32%)</td>
<td>3 (5%)</td>
<td>77 (39%)</td>
</tr>
</tbody>
</table>
Inaccuracies on purpose

(Illustration of approximate exposure location; each dot does not necessarily represent individual person)
Data Limitations

- Injured people
- Medical records
- Some injuries not identified
- Timeframe of interviews

Source: Associated Press Photo/Tony Gutierrez
The Tier II database

Dallas Morning News - 74 Ammonium nitrate storage facilities

Source: Dallas Morning News
Texas Fire Marshal Results

INVESTIGATION FFF FY 13-06

- Undeterminable cause
- Electrical malfunction or arson
- Ammonium nitrate

Source: Kapavik
Lessons Learned

• Access to outside agencies data
• Consulate with ESRI disaster team sooner
• Established relationships with locals
• PTSD training/awareness
• Utilize existing GIS capacity at other levels
• Utilize statisticians within agency
• Protecting the data
After Action Report

Response
• Flex Viewer – training, updating quicker
• Print - scale

Investigation
• Team – More analysis, statistical
• Interviewers – mapbook vs. wall maps

SWOT
Next Steps

• Updated Response Geodatabase
• STARmap - Flex Viewer
• Training Staff
• ArcGIS Online and Collector
• Ready-to-Use Maps
• Sharing mapping approaches
• Release of final report

www.waco-texas.com/cms-healthdepartment
Special acknowledgement to local West officials, residents, fire fighters, and others affected by the explosion who, despite enormous grief and displacement, graciously contributed information for this investigation.

Source: Ron Jenkins/Fort Worth Star-Telegram/MCT
Thank you

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