Tornado Preparedness and Response: A Simulation Exercise for Issues in Public Health

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Objectives

• Train future public health professionals in preparedness and response to a natural disaster

• Train future public health professionals in the basics of triage

• Simulate the experience through actual scenarios

Why tornadoes?
Tornado Facts

- A violently rotating column of air extending from a thunderstorm to the ground.
- Average of 70 fatalities and 1,500 injuries in the U.S. each year.
- The strongest tornadoes have rotating winds of more than 250 mph.
- The average forward speed is 30 mph but may vary from nearly stationary to 70 mph.
- Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer.
- Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time.

Dr. T Theodore Fujita

- Developed a damage scale (Fujita 1971, Fujita and Pearson 1973) for winds, including tornadoes, which was supposed to relate the degree of damage to the intensity of the wind.
- Replaced by an enhanced version.
- The enhanced F-scale took effect in 2007.

The Enhanced F-Scale

- The Enhanced F-scale is a much more precise and robust way to assess tornado damage than the original.
- It classifies F0-F5 damage across 28 different types of damage indicators
- Mainly various kinds of buildings, but also a few other structures as well as trees As with the original F-scale, the enhanced version will rate the tornado as a whole based on most intense damage within the path.
**Enhanced F-Scale for Tornado Damage**

<table>
<thead>
<tr>
<th>F Number</th>
<th>Fastest 1/4-mile (mph)</th>
<th>3 Second Gust (mph)</th>
<th>EF Number</th>
<th>3 Second Gust (mph)</th>
<th>EF Number</th>
<th>3 Second Gust (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40-72</td>
<td>45-76</td>
<td>0</td>
<td>65-85</td>
<td>0</td>
<td>65-85</td>
</tr>
<tr>
<td>1</td>
<td>73-112</td>
<td>79-117</td>
<td>1</td>
<td>86-109</td>
<td>1</td>
<td>86-110</td>
</tr>
<tr>
<td>2</td>
<td>113-157</td>
<td>119-161</td>
<td>2</td>
<td>110-137</td>
<td>2</td>
<td>111-135</td>
</tr>
<tr>
<td>3</td>
<td>158-207</td>
<td>162-209</td>
<td>3</td>
<td>138-167</td>
<td>3</td>
<td>136-165</td>
</tr>
<tr>
<td>4</td>
<td>208-260</td>
<td>210-261</td>
<td>4</td>
<td>168-199</td>
<td>4</td>
<td>166-200</td>
</tr>
<tr>
<td>5</td>
<td>264-318</td>
<td>262-317</td>
<td>5</td>
<td>200-234</td>
<td>5</td>
<td>Over 200</td>
</tr>
</tbody>
</table>

**Tornado Surveillance Data**
- As of September 20, 2014, there have been 923 U.S. tornadoes and even though the overall tornado season has already climaxed, more tornadoes are expected.

**NOAA Climate Data Center**
New Research in Tornado Alley

- Residents of tornado alley should ready themselves for the height of tornado season to come up to weeks earlier than the past, according to a new study published in the journal Geophysical Research Letters.

- Given that “tornado alley” doesn’t have a strict geographical definition, the authors looked at Nebraska, Kansas, Oklahoma, and northern Texas.

New Research in Tornado Alley

- In these locations, the peak of tornado season was around May 26 in the 1950s. By the early 2000s, it had shifted to May 19.

- That seven day shift was found by looking at tornadoes of all intensity. However, by removing F0 tornadoes, the least damaging tornadoes on the Fujita scale, that shift increases to 14 days earlier.

Why the change?

- While it is clear that tornadoes are occurring earlier now than they were in the mid-20th century, it’s not readily apparent what is causing the shift.

- Given that good tornado records only date back to 1950, it is inherently difficult to do an in-depth analysis of changing trends. There are also regional influences at play — topography and land use.
Why the change?

- Greg Carbin, the warning coordination meteorologist at the Storm Prediction Center, notes that it’s possible a warming climate is behind some of the changes, due to the influence of seasonal temperature changes on the jet stream.

- “If winters are not as cold, or if spring times are warmer, the location of the jet stream is most likely displaced north of where it has been in the past,”

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El Niño

- In addition to potential changes in the jet stream, researchers on the study found a link between El Niño events and tornado activity in Oklahoma.

- “The relationship we do see in Oklahoma is a light but significant connection to El Niño,” said Paul Stoy, a professor in the Department of Land Resources and Environmental Sciences at Montana State University, and co-author of the study.

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El Niño

- “This makes one suspect that if global climate change is changing these larger circulations, then there is a connection between a global [variability] and tornado activity.”
Tornado Volatility

- Not only is the tornado season shifting, but year-to-year swings in tornado activity are growing. A study released this week concludes that the volatility of tornado reports has increased since 2000 — changes which cannot simply be explained by reporting practices.

Tornado Volatility

- A volatility increase is also seen in a tornado environment index which measures the favorability of atmospheric conditions to tornado activity, providing evidence that the recent increase in tornado report volatility is related to the physical environment.

Tornado Exercise
Training

• Incident Command System

• SALT and START Triage

• Emergency Operations Planning

Real Counties. Real Life.

• Four counties in Kansas

• Mix of heavily populated and lightly populated

• Urban and rural

• Included Kansas City

Weekly Exercises

• Students were divided into four counties

• Met after each class to work on their exercises

• Involved all roles of incident command as well as supplementary roles (e.g., mayor, school board member, store owner)
Tornadoes Strike the Kansas Counties

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Paul Rega, MD
Interprofessional Immersive Simulation Center
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Counties Respond in the Command Center

Counties Respond in the Command Center
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Triaging the Victims
Triaging the Victims

Triaging the Victims

Triaging the Victims
Triaging the Victims

The Aftermath and Recovery
Alternative Care Sites and Shelters

• Where are they located?

• What services are provided?

• How do you respond to possible cases of infectious diseases at these sites? Ebola? Enterovirus? More...

Points of Emphasis

• How does your county return to normalcy?

• What is the proper sequence of steps?

• How long should this take?

• What do you need to keep in mind?

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