Introduction: Social Vulnerability Analysis of Oklahoma Counties helps identify the preparedness of a region to natural disasters by examining the socio-economic factors known to impact hazard risk and comparing them to a database of hazardous weather events. The areas indicated as most vulnerable provide Emergency Preparedness Educators with targets for impactful hazard education campaigns. Factsheets for other counties, details of the research methodology, raw data used in these analyses, and additional resources for studying Social Vulnerability can be found at the website: http://oksovi.geog.okstate.edu.

Social Vulnerability Analysis
Social Vulnerability Analysis (SVA) examines the relationship between demographics of a region and how susceptible that region's population is to a discrete hazardous event, whether a chemical spill or a natural disaster. Several different tools have been developed to calculate a numerical value and quantify vulnerability, but the Social Vulnerability Index (SoVI) has become the standard method of SVA and is utilized by the US Army Corps of Engineers because of its academic rigor and continued development.

The initial iteration of the SoVI was called the Social Vulnerability Index, or SVI, and was based on eight generic and easily acquired variables from the U.S. Census Bureau’s American Community Survey. The current iteration was developed quickly thereafter, and has not changed substantively, merely adapted to changes in census data. Improvements to SVI found in SoVI include increased census inputs to twenty-nine, utilization of more specific census inputs, and including some as compound variables rather than simply accepting raw census values into the index calculation. The most import factors found to increase social vulnerability in the national SoVI included wealth, age, special needs, service sector employment, gender, ethnicity and lack of health insurance, and race and social status.

What does SoVI have to offer Emergency Managers and Educators? SVA cannot predict where severe weather events will occur, only calculate the theoretical level of community risk when faced with natural disasters. A major criticism of the SoVI method is the lack of a proven relationship with actual disasters. By comparing the SoVI results with recorded natural disaster events it may be possible to correlate specific weather hazards with particular SoVI factors and target educational efforts towards those areas and populations indicated as most vulnerable, maybe even by hazard type. This natural disaster record exists as the National Oceanic and Atmospheric Administration Storm Events Database, and is discussed further on page 2. In addition to investigating a correlation between SoVI and natural disasters in Oklahoma, the relative importance and direction of influence of each factor within the SoVI formula may vary from the national results, increasing the models fit to Oklahoma’s situation.

The ultimate outcome of this research project is hopefully that correlation between SoVI and specific weather hazards can be found. The first phase is the completion of SoVI and analysis of storm events county-by-county and sharing of these results on our public data portal. Additionally, processed SoVI and storm events data will be shared. The second phase is to move to the tract level and compute SoVI and analyze storm events at this finer resolution, with results also published to the data portal. The availability of this tool should assist Emergency Management Educators working towards more effective emergency response education campaigns.

Demographics & SoVI of Garvin County
The Garvin County SoVI value for the 2010-2014 period is .998. This value puts Garvin County in the medium high quintile, or an above average amount of vulnerability for counties in Oklahoma.

The bar chart below (Figure 1) displays the top three correlated variables from the top three factors that increase social vulnerability based on the statewide analysis, in descending order. These variables' z-scores are weighted by each factor's ratio of SoVI variance explained, and directionality indicating how it's affecting Garvin's SoVI by increasing or decreasing vulnerability. In terms of Wealth, Median Age increases the SoVI for this county. However, Percent Hispanic and Median Home Value in Garvin County decreases the social vulnerability due to the negative loading of these variables. For Age, all attributes of this factor have positive z-scores, which suggest this county is more socially vulnerable.

With regards to Hispanic, Per Capita Wealth and Percent ESL decrease the SoVI while Percent Extractive Work increases it. These values indicate why Garvin County has been ranked in the second-highest quintile for social vulnerability.

Fig. 1: Garvin Co. Selected Variable z-scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wealth</th>
<th>Age</th>
<th>Hispanic</th>
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</thead>
<tbody>
<tr>
<td>Median Age</td>
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<td></td>
<td>0.03</td>
</tr>
<tr>
<td>% Hispanic</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Median Home Value</td>
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<td>0.02</td>
<td></td>
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<tr>
<td>% No Auto</td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>% Renter</td>
<td></td>
<td>0.05</td>
<td></td>
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<tr>
<td>% In Poverty</td>
<td></td>
<td></td>
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<tr>
<td>Per Capita Wealth</td>
<td>-0.03</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>% Extractive Work</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>% English SL</td>
<td></td>
<td>-0.02</td>
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</tbody>
</table>

Increasing Vulnerability

Fig. 3: Garvin County, OK

Fig. 2: Oklahoma SoVI Quintile Ranks by County

Fig. 5: Garvin Top 5 Reported Events and Damage

Charts Figure 5 and Figure 6 show that Garvin County was afflicted by a variety of hazardous weather events during the 2010-2014 study period. Categorically, the most frequent were related to severe thunderstorm events. Hail was the top weather event in each month of the year organized by season. The least reported events and caused the greatest amount of damage (in dollars) for the study period. Flooding was one of the most frequent and 2014.
NOAA Storm Events Database

Weather event data shown here comes from the National Oceanic and Atmospheric Administration’s (NOAA) Storm Events Database\(^4\). This database collects “storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce”. That this database is a selection of hazardous weather events affecting people is important to remember when analyzing the data, it in no way represents every weather event which actually occurred nor is that desirable for this application.

Within Garvin County, two weather events were the most often reported and the most damaging (Figure 4). The background fill is a density map of hail point reports and overlaying this is the tracks of tornadoes reported in Garvin County between 2010 and 2014. Charts Figure 5 and Figure 6 show that Garvin County was afflicted by a variety of hazardous weather events during the 2010-2014 study period. Categorically, the most frequent were related to severe thunderstorm events. Hail was the top reported event but did not account for the most amount of damage (in dollars) for the study period. Flooding was one of the least reported events and caused the greatest amount of damage in Garvin County. Other hazardous events with recorded damages but were reported less frequently include Thunderstorm Wind and Lightning. Tornado events were also reported but did not contribute to the recorded damages.

The residents of Garvin County also face different hazard risks throughout the year. Figure 7 displays the most frequent weather event in each month of the year organized by season.

Closing:

One goal of the EPSCoR research grant is to help planners, educators, and citizens of Oklahoma make decisions how to prepare for shifts in climate and the risks that come with it. While most Oklahomans are well aware of the threats severe weather can present, many may not be aware of the social vulnerability of their community or other communities around the state. As a first step toward increasing awareness about social vulnerability across Oklahoma, the information in this factsheet provides an overview of the components of social vulnerability and a recent history of specific weather hazards in Adair County.

To learn more about social vulnerability throughout Oklahoma, please visit oksovi.geog.okstate.edu. Additional factsheets provide information about differences in social vulnerability throughout the state on a county by county basis.

For those interested in educational materials, our website also contains links to (i) all the data used in this analysis, (ii) explanations and examples of our procedures for anyone wanting to examine social vulnerability themselves.

References:

3. oksovi.geog.okstate.edu

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For more information about the EPSCoR project or its Climate Variability Research efforts, visit the website: http://www.okeps.cor.org/research/climate-variability-research.