



# The Influence of Tornado Knowledge and Perceptions on Safety Actions Taken among Undergraduates

Sabrina Jauernic and Matthew Van Den Broeke

Department of Earth and Atmospheric Sciences: University of Nebraska - Lincoln

## Introduction

There were an estimated **21.8 million students** attending universities last semester. With so many students on university campuses it is important to know how they are responding to warnings. Studies have recently been done (Hoekstra 2012) and (Nichols 2012) separately showing how K-12 and university administrators respond and relay critical information during tornado warnings. No studies have been done showing exactly how students at universities respond to this critical information. Results of the preliminary analysis will focus on possible relationships between the source of previously learned tornado knowledge, source of tornado warnings, perceptions of the dangers of tornadoes, and the safety actions taken in severe events. Geographical differences in knowledge and safety actions taken will also be analyzed.

## Methods

- ❖ In the Fall of 2012 a survey of 613 undergraduate students was taken in introductory science courses. In total, 12 questions regarding tornado knowledge and 8 questions regarding tornado safety were asked; many questions could fall into either category.

- ❖ **400 Surveys** have been coded for analysis thus far:

- **76%** Nebraska
- **14%** Great Plains/Midwest
- **6%** Other areas of the U.S.
- **3%** International Students
- **1%** left blank or no legible answer.

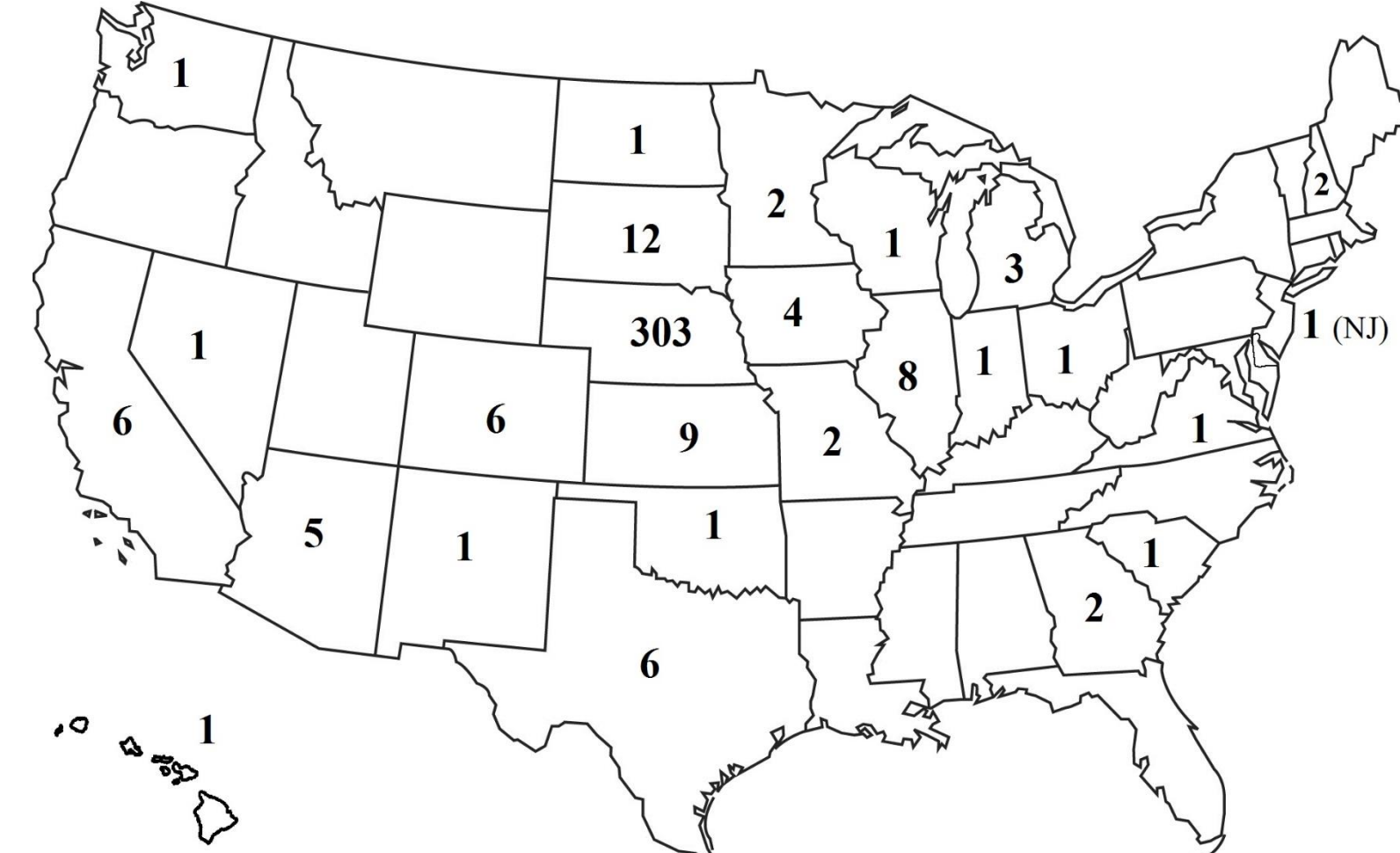


Figure 1: Distribution of surveys from U.S. and international countries.

- ❖ The surveys were separately analyzed by 2 people. Initially there was a nearly 88% agreement between the analysis; after discussion there was 100% agreement.

### General questions:

- Home state
- Number of years lived in Nebraska
- Source of previous tornado knowledge
- Source of tornado warnings

### Tornado Knowledge Score:

- Difference between tornado watch and warning
- Likelihood of different geographic areas being affected by tornadoes
- Directions that tornadoes could potentially move
- Typical wind speeds, among others

### Tornado Safety Score:

- Having a safety plan in place
- Warning response rate
- Appropriate action during warning
- Safety actions to take if caught outside
- Safest location in basement

\* One question was discarded due to poor question construction and lack of understanding among respondents.

\* Knowledge and Safety Scores were discarded when more than 30% of the questions contributing to those scores were blank.

## Results

Location	Number of Students	Knowledge	Safety
Nebraska	282	0.38	0.64
Great Plains/Midwest	56	0.37	0.59
Other U.S.	20	0.33	0.46
International	7	0.27	0.55

Table 1: Regional effects on knowledge and safety scores.

Knowledge Source	Number of Students	Knowledge	Safety
Elementary School	197	0.36	0.61
TV/News (unspecified)	77	0.39	0.63
Parents/Family	52	0.40	0.67
High School/College	13	0.40	0.62
Self-Taught	10	0.33	0.63
Friends/Others	4	0.34	0.45
Common Knowledge	3	0.34	0.69

Table 2: Knowledge source effect on knowledge and safety scores.

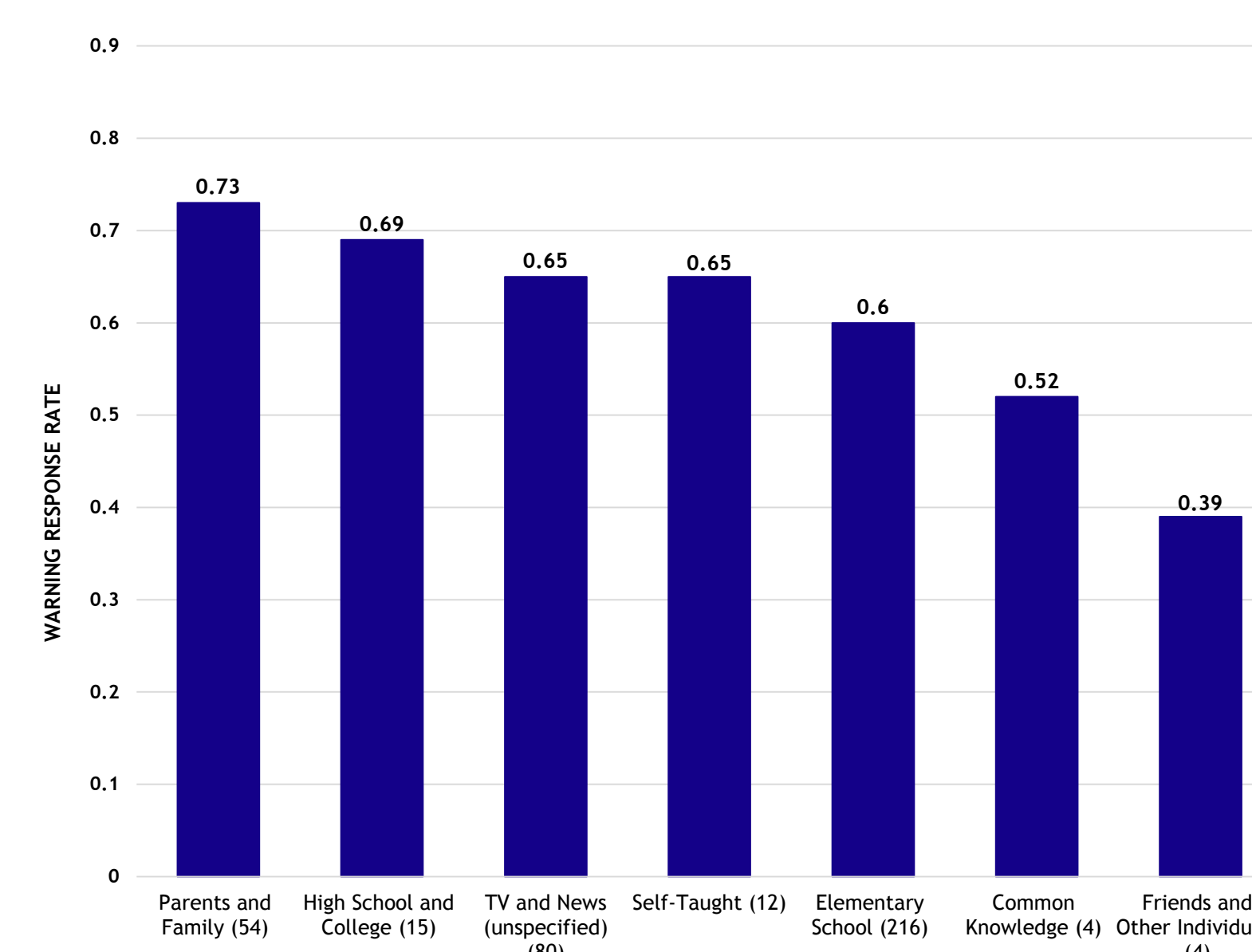


Figure 2a: Tornado warning response rate as function of knowledge source.

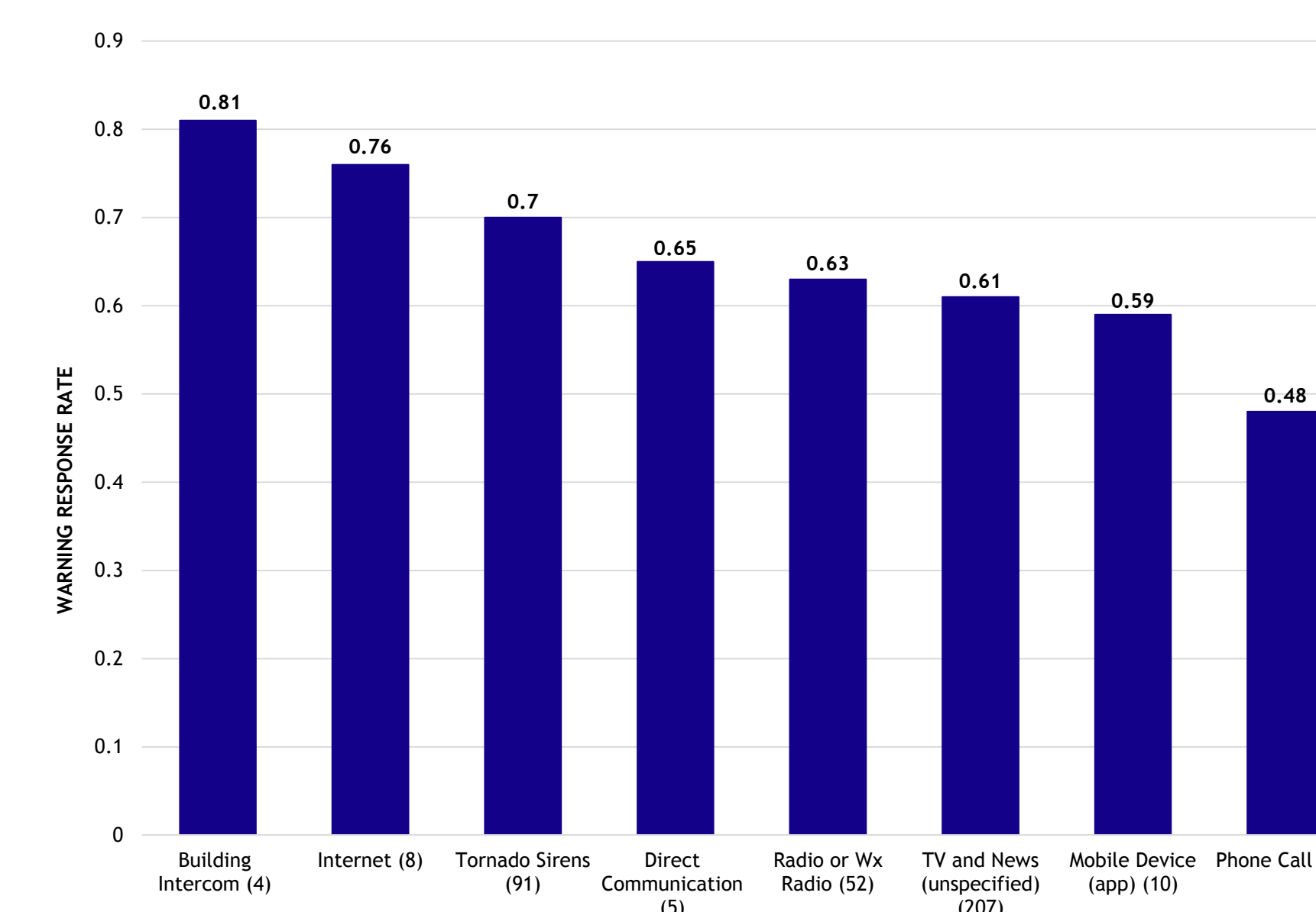


Figure 2b: Tornado warning response rate as function of warning source.

Lincoln, NE vulnerability	Tornado Warning Response
More	0.74
Equal	0.66
Less	0.61
'I don't know'	0.64

Warning Response Rate	'I don't know'	Less Vulnerable	Equally Vulnerable	More Vulnerable
0 - 25%	20%	26%	24%	14%
25 - 50%	14%	15%	14%	0%
50 - 75%	10%	10%	09%	14%
75 - 100%	43%	44%	50%	71%

Table 3: Influence of perceived vulnerability on tornado warning response rate.

Strong Tornado Wind Speed Estimate	Warning Response Rate
<80 mph	.61
80 to 150 mph	.66
151 to 250 mph	.59
251 to 400 mph	.65
>400 mph	.59
'I don't know'	.71

Table 4: Influence of perceived wind speed on tornado warning response rate.

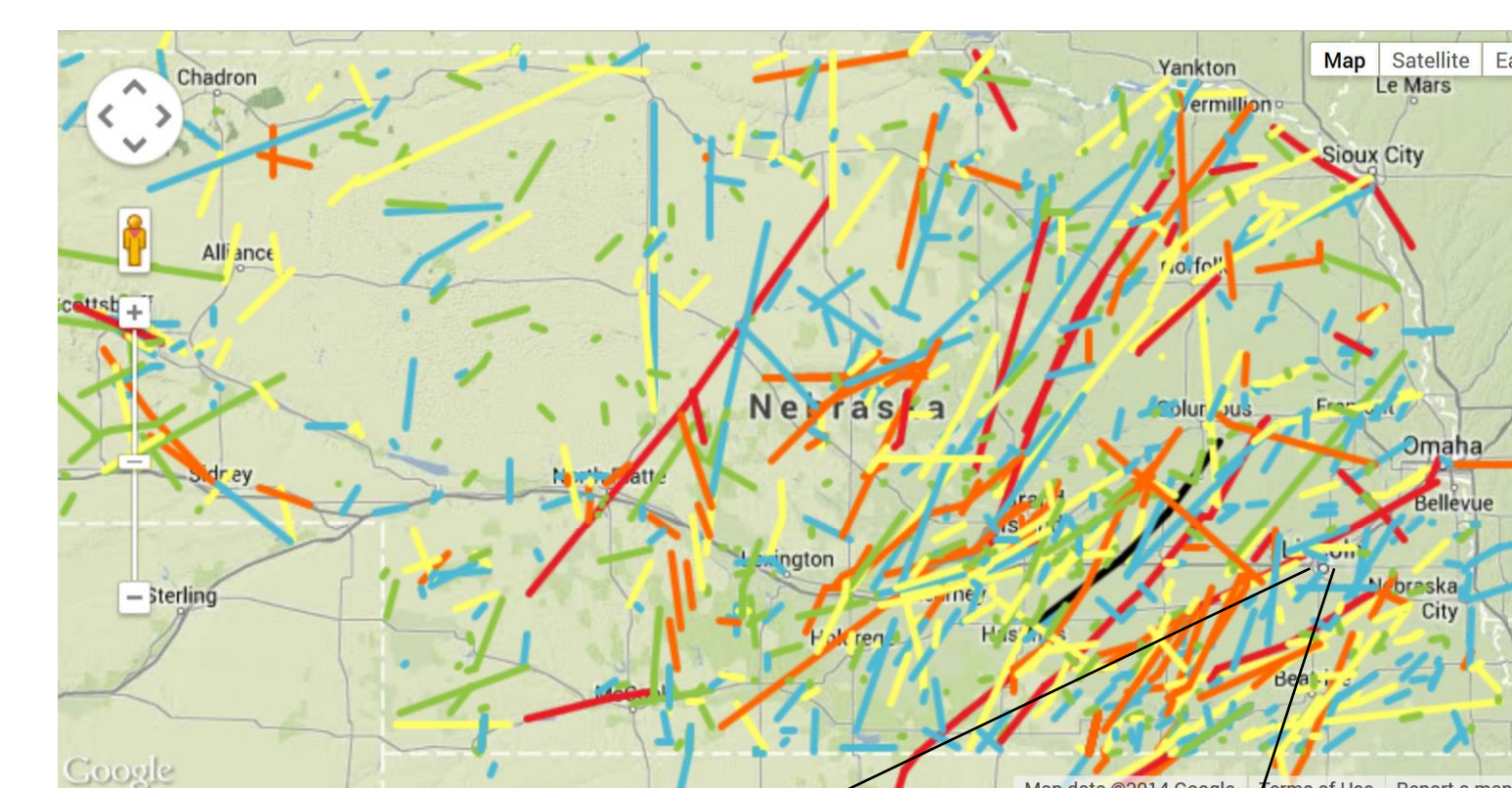


Figure 3a – 3b: Strength and paths for all tornadoes from 1950 to 2012 in Nebraska. Inset shows Lancaster CO.

Source: <http://tornadohistoryproject.com/>

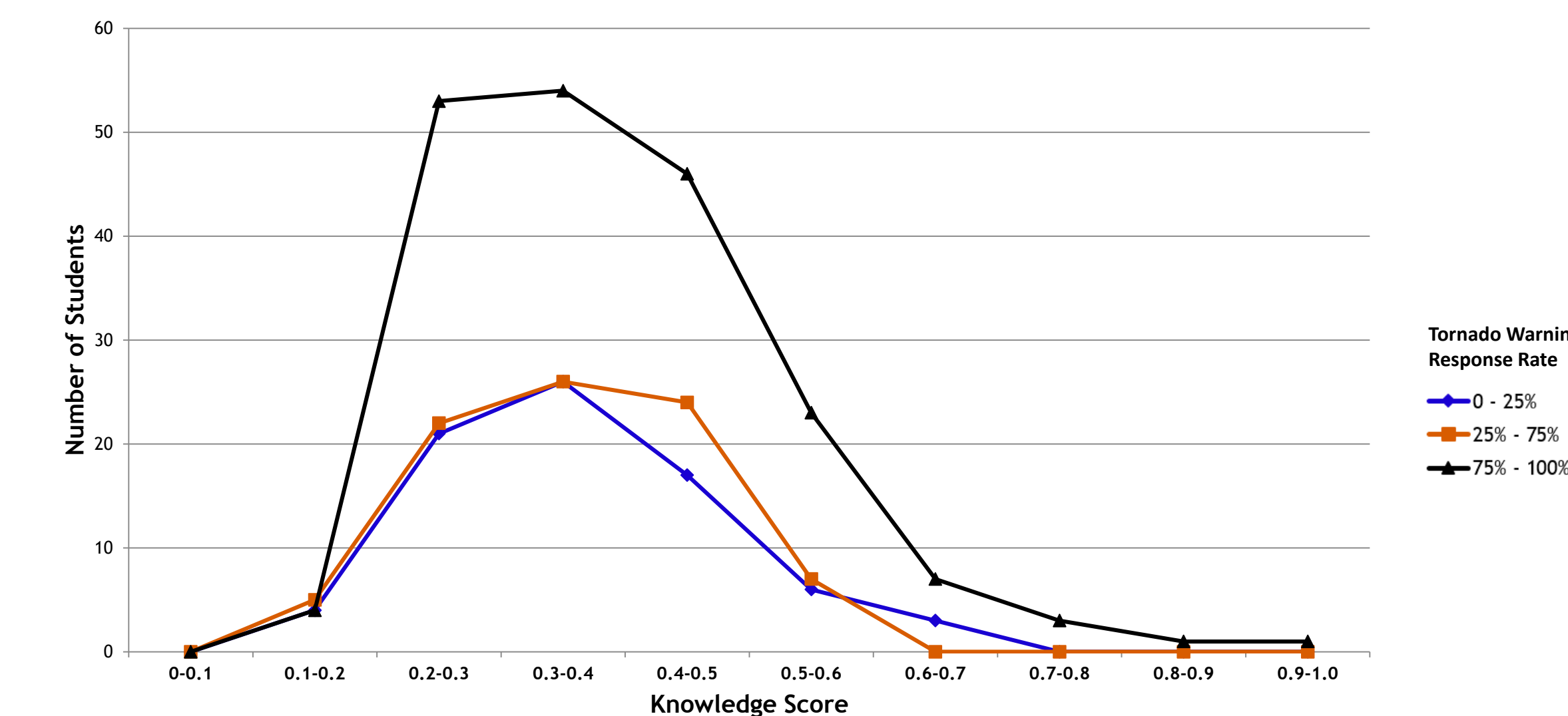


Figure 4: Knowledge score distribution for different levels of response to tornado warnings.

Safety Question	Poor Response	Moderate Response	Good Response
How did you respond during the most recent tornado warning?	14.5%	45%	31.5%
What should you do if caught outdoors?	20%	70%	9%
Do you have a tornado safety plan in place at home?	NO: 20%		
At school or work?	NO: 32%		

Table 5: Percentage of good, moderate, and poor responses for various safety questions.

Myth	Percent that believe it
Hills affect tornadoes	55%
Rivers affect tornadoes	51%
Overpasses are safe	32%
Should open windows	25%
Lincoln's 'bowl' shape affects tornadoes	20%

Table 6: Various tornado myths and percent that believe them.

## Conclusions

- ❖ Students from the Great Plains generally have better knowledge of tornadoes, and take better safety actions.
- ❖ Parents, general education, and media sources seem to be good sources of knowledge.
- ❖ Students who receive their warnings from building intercoms, the internet, and tornado sirens have the highest response rate.
- ❖ Many myths about tornadoes still remain, such as taking shelter under a highway overpass, or hills and rivers affecting tornadoes.

## Future Work

Questions will be revised with the aid of a social scientist. The revised surveys will be web-based, and will be distributed to a wider audience to gain better geographic diversity. Individual interviews may also be done.

## References

Hoekstra, M.S. (2012): *How K-12 school district officials made decisions during 2011 National Weather Service warnings*, M.S. Thesis. Oklahoma University: U.S.

Nichols, M.S. (2012): *How university administrators made decisions during National Weather Service warnings in the spring of 2011*, M.S. Thesis. Oklahoma University: U.S.

National Center for Educational Statistics: [http://nces.ed.gov/programs/projections/projections2021/tables/table\\_20.asp](http://nces.ed.gov/programs/projections/projections2021/tables/table_20.asp)

## Acknowledgements

Thank you to Andrew Gabel for helping design the preliminary survey. Thank you to Michael Veres for help with figures. Also an acknowledgement to the University of Nebraska-Lincoln for providing Teaching Assistantship funding.