Influence of Social Capital on Tornado Warning Comprehension, Reception, and Response

Riley Worley – Univ. Of Oklahoma Department of Political Science

Joe Ripberger – Institute for Public Policy Research and Analysis

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Introduction

- Goal: Clarify the role that social capital plays in warning comprehension, warning reception, and the decision to act during tornadoes
- Mixed literature on social capital as a factor across a variety of disasters
- Results: Modest, mixed impact on factors that increase safety during storms
- Most significant impact on objective tornado warning comprehension

Motivation

- Unclear role of social capital in previous literature
  - Informal communication about disasters varies based on community demographics
  - Family/community dynamics guide decision to act during disasters
  - Trust in emergency response/civil society may cause inaction during disasters
- Social capital plays a strong role in communities that do not receive/understand official communications
  - Extent of generalizability?
  - Possible decrease in reliance when official communications available (Silver and Andrey 2019)



Measuring Social Capital

- Data from Chetty et al. (2022)
  - Measures social capital using data from 72.2 million Facebook users
  - Focus on ages 25-44
  - Measurement at zip code level
- Measurements used (standardized as z-scores)
  - Clustering: strength of social groups; percent of user's friends who have mutual friends
  - Support Ratio: localization of social networks; percent of user's friends who live in the same zip code
  - Volunteering Rate: engagement in civil society; percent of users in a zip code who are members of a volunteering group
  - Economic Connectedness: bridging social capital; measures connectivity between high and low socioeconomic status users



Tornado Warning Data

- Data from the Severe Weather and Society Survey from 2018 to 2023
  - 15,423 individual responses
- Measurements from Ripberger et al. (2019)
  - Objective tornado warning comprehension (assessed knowledge)
  - Subjective tornado warning comprehension (self-reported knowledge)
  - Tornado warning reception
  - Tornado warning response

Empirical Strategy

- Huber regression (modified OLS to account for outliers)

$$Y = \beta_0 + \beta_s X_s + \beta_1 X_{ed} + \beta_2 X_{age} + \beta_3 X_{CWA-Torn} + \varepsilon$$

$$\rho(\varepsilon_i) = \begin{cases} \varepsilon_i^2 & if\ |\varepsilon| \leq k \\ 2k|\varepsilon_i| - k^2 & otherwise \end{cases}$$



Results: Clustering

	Coeff. Without Controls	Coeff. With Controls
Objective Comprehension	.079***	.062***
Subjective Comprehension	.055***	.047***
Warning Reception	.020*	.018*
Warning Response	.004	.005

* p < .05, ** p < .01, *** p < .001

Results: Support Ratio

	Coeff. Without Controls	Coeff. With Controls
Objective Comprehension	.069***	.056***
Subjective Comprehension	.021**	.017*
Warning Reception	-.002	-.001
Warning Response	-.012	-.009

* p < .05, ** p < .01, *** p < .001

Results: Volunteering Rate

	Coeff. Without Controls	Coeff. With Controls
Objective Comprehension	.071***	.059***
Subjective Comprehension	.031***	.026**
Warning Reception	-.011	-.006
Warning Response	-.007	-.007

* p < .05, ** p < .01, *** p < .001

Results: Economic Connectedness

	Coeff. Without Controls	Coeff. With Controls
Objective Comprehension	.017**	.021***
Subjective Comprehension	-.042***	-.031***
Warning Reception	-.049***	-.030***
Warning Response	-.038***	-.036***

* p < .05, ** p < .01, *** p < .001

Takeaways

- Group strength, localization, and volunteering rate notably impact objective warning comprehension
- Mixed results for other dependent variables
- Social capital explains a modest portion of total variation
- Economic connectedness (instrument for separation between groups) negatively related with all but objective warning comprehension



Implications

- People use informal networks to share safety information prior to storms
- People with lower clustering, support ratio, or volunteering rate more vulnerable
- Bonding social capital results in less vulnerability, bridging social capital may result in more vulnerability

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