

## Using Risk Indicators to Predict Collaborative Emergency Management Activity and County Emergency Preparedness

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## **Abstract:**

This study incorporates several groups of important variables to build a comprehensive “risk profile” for county emergency management. The risk profile consists of county demographic characteristics, past experience with disasters, perceptions of emergencies of concern to county EM managers, and social capital. Based on responses to a national survey of counties, empirical analysis shows that elements of the risk profile are associated with the EM collaborative capacity of a county, and further that the risk profile and collaborative capacity are related to several measures of county EM preparedness and planning. These results suggest that county EM managers integrate a variety of objective and subjective measures in assessing the preparedness of their jurisdictions for emergencies and disasters.

## **Introduction: Emergency management as collaborative public management**

Although the effectiveness of a community’s post-disaster response has been of interest to emergency management (EM) scholars, the literature looks increasingly at how communities can plan proactively for emergencies. Some of the most recent research on emergency planning has emphasized the tools that emergency managers employ to prepare for disasters, including the adequacy of public policies (Buck, Trainer and Aguirre 2006; Moynihan 2005; US GAO 2008), the impact of managerial capacity on emergency preparedness (McGuire and Silvia 2009; McEntire 2007; Stanley and Waugh 2001; Waugh and Streib 2006; Wise 2006), and the ability of local governments and voluntary associations to work collaboratively in emergency management (Brudney and Gazley 2009; Kapucu 2006).

Altogether, this scholarship describes 21<sup>st</sup> century emergency management as an activity dependent on both horizontal and vertical networks comprising a much wider collection of public and private sector actors than traditionally conceived. Lessons from past emergencies, including most notably those that occurred in the 2004 and 2005 hurricane seasons, demonstrate that communities rely for assistance not just on the local, state and federal authorities and the voluntary organizations active in disaster (VOADs) which are expected to respond. Assistance comes also from spontaneous volunteers and secondary and tertiary level actors such as local businesses and social service and philanthropic nonprofit organizations ranging from Wal-Mart to community foundations to faith-based organizations (Brudney and Gazley 2009; McGuire, Brudney and Gazley 2009; Waugh and Sylves 2002).

A highlight from this research stream is the potentially strong association between collaborative planning (both within and across sectors) and the effectiveness of a community’s response. In the sociological literature, collaboration has been addressed within the context of emergency management in terms of the ways that volunteers cope with stress (Dynes and Tierney 1994); preparedness planning assumptions (Quarantelli 1984); community response, interorganizational relations, and group emergence (Quarantelli 1978); and planning at the individual, group, and community levels (Mileti, Drabek and Haas 1975; Drabek 1986).

With but few exceptions (e.g., Drabek and Hoetmer 1991; Kaplan 1996), until just a few years ago disaster planning manuals and professional guidelines offered a limited view of collaborative planning and voluntary resources. However, the increased number and scope of recent disasters have encouraged more in the field to call for a holistic and comprehensive approach to emergency management policy and research (Hardenbrook 2005; McEntire 2005). As a policy framework, the attention has focused increasingly on local emergency management capacity and networks (e.g., US GAO 2008).

At the local level, where initial responsibility for emergency management generally resides, emergency management is fundamentally a county government function (Waugh 1994). As reflected in practice, however, the realization is growing that except for the smallest of emergencies (e.g., combating limited fires), no one organization can do it all. In addition to the greater interest in the scope of the emergency management networks, a portion of recent EM scholarship focuses on the county emergency manager's role in effectively leading this network through the core functions of mitigation, preparedness, response, and recovery.

This emphasis on managerial capacity is consistent with the post-institutionalism of much of the current public and nonprofit management literature (see for example, the streams of research on public service motivation, social network analysis, and collaborative public management). Kapucu, Augustin and Garayev (2009) argue, for example, that the strongest element in regional EM partnerships is skilled personnel. Solansky and Beck (2009) test the influence of joint disaster exercises on collaborative motivations of public managers. Weber and Khademian (2008) caution network scholars to consider the mindset of emergency managers and their willingness and capacity to collaborate.

Some researchers argue that emergency management requires much stronger training in collaborative management. According to McGuire, Brudney and Gazley (2009), "the 'New' Emergency Manager is very much a generalist manager to the same extent as any other public sector official who leads an agency, but also a specialist in the field of emergencies and disasters, a boundary spanner, and a creator of networks." McGuire and Silvia (2009) and Waugh (2003, 3) observe further that emergency managers hold a "quintessential government role" that deserves greater study, and that the field of EM offers the potential to test many of the general propositions of collaborative public management.

Of particular interest, both in the collaborative literature generally and also in the emergency management literature specifically, is the role that managerial perceptions can play in fostering relationships between individual and institutional actors. Most of the institutional arrangements that connect emergency management networks are informal or ad hoc, or formalized only through general statutory expectations (especially the National Response Framework and National Incident Management System (NIMS)) (McGuire and Silvia 2009; Waugh and Sylves 2002). Those personnel on the ground during emergency drills and exercises or actual events understand that interpersonal relationships and prior collaborative experience can support and promote joint efforts beyond the level required by statutory authority, but this connection can be less visible to the institutional scholar who relies for information on cross-sectional data and formal contracts (Buck, Trainor, and Aguirre 2006; Drabek 2003; Gazley 2008; Perry 2004).

And although most emergency managers have long understood the value of building interpersonal relationships among organizations and stakeholders, even to the point of employing professional facilitators or hiring an individual who serves as a liaison, joint exercises seldom involve potential private sector actors that might be involved in a disaster or catastrophe (Brudney and Gazley 2009; Drabek 2003; U.S. GAO 2008). Prior to the advent of the National Response Framework in 2008, one conclusion some scholars drew from research on disasters is that the major federal policy instrument for organizing disaster response at the time, the National Response Plan, developed in the post-9/11 environment, did not adequately capture the non-hierarchical, network dimensions of emergency management and the scope of potential collaborative activity (Hardenbrook 2005; McGuire, Brudney and Gazley 2009; Wise 2006).

The National Response Framework (2008), developed post-Katrina, incorporated Volunteer and Donations Management and Private Sector Coordination Support Annexes. In addition, FEMA is in process of developing expanded Partner Guides, detailing the roles, functions, and interactions of various groups and organizations. Partner Guides, in particular, will provide references describing key roles and actions for local, tribal, State, Federal, and nonprofit/private-sector response partners. The Framework also suggests that states and local organizations follow the federal lead and incorporate such elements in state and local plans and procedures.

Although county emergency managers play a central role in effective disaster response, still missing from much of the discussion is a potential role for all voluntary sector actors and the contextual factors that might shape managerial perceptions of collaborative advantage or necessity. In other words, there is a “push” and a “pull” behind collaborative activity in the EM field: the “pull” is based on perceived need and risk level, while the “push” relies on opportunity and jurisdictional capacity. In this article, we employ this notion of a perceptual framework to examine how a community’s physical and demographic characteristics, and prior collaborative experience, may affect collaborative activity and managerial perceptions of emergency planning and preparedness.

### **Framing emergency management capacity in the context of community characteristics and experiences**

“Adaptive management” offers a useful theoretical framework for understanding emergency managerial capacity given its emphasis on organizational learning, managerial flexibility and responsiveness as a source of institutional resilience (Reddick 2008; Wise 2006):

When uncertainty is the rule and the magnitude, scope, and timing of the response required by the emergency are complex and unknown, ordinary instruments of planning are inadequate.... Managers must develop organizational learning capacity by employing three rational processes: risk assessment, information feedback to decision makers, and adjustment of performance based on current information (Wise 2006, 314).

Particularly in networked settings that depend on ad hoc or untested relationships, adaptive management and collaborative capacity can become closely related concepts. Both concepts

emphasize a set of proactive, strategic leadership and coordination skills that emergency managers need to operate in a dynamic professional environment that requires some degree of improvisation (Alexander and O’Leary 2009; Bardach 1998; Drabek 2003; Waugh 2009; Weber and Khademian 2008).

Studies exploring the application of adaptive management and collaborative capacity in emergency contexts suggest that the quality of managerial training and education, and also experience with joint exercises can increase a manager’s perception that the community has achieved an adequate state of preparedness (Kapucu, Augustin, Garayev 2009; Reddick 2008; Solansky and Beck 2009). Of less interest in the scholarship have been the community characteristics that might foster adaptive management and collaborative capacity. Community characteristics are, however, of great interest to those seeking to understand the relative vulnerability of a community to natural or human hazards.

This study attempts to bridge that research gap by testing the association between community characteristics, collaborative activity, and emergency management capacity. A null hypothesis position would pose emergency planning as a function of county resources (staff, budget) and risk level. But we argue that a range of additional factors can influence an emergency manager’s situational awareness and interest in collaborative planning, including not only a community’s geophysical characteristics and level of vulnerability should a disaster strike, but also past experience with partnerships, future collaborative opportunities, and resources that might support collaborative activity such as voluntary organizations and community social capital.

To understand how these resources and, most especially, how collaborative activity might predict emergency management capacity, we model the following:

Risk profile or vulnerability (prospective disaster experience) → Collaborative Activity → Emergency management capacity

Incident experience (past disaster experience) → Collaborative Activity → EM capacity

Collaborative capacity → Collaborative Activity → EM capacity

We measure EM capacity (the dependent variables) in two groups of variables: (1) EM resource capacity such as training and staff, and (2) an emergency manager’s perception of EM preparedness. The inclusion of both subjective and objective measures of capacity, and of multiple dependent variables, strengthens the model’s predictive power.

As independent variables, we focus on three potential sources of information and experience that emergency managers have at their disposal to increase their emergency management capacity: (1) *Risk profile*, or the geophysical location of the community, the nature of the risks it faces and potential severity of the impact on vulnerable populations, and a public manager’s perception of the threat level, (2) *Incident experience*, or a community’s past experience with natural and human disasters; and (3) *Collaborative capacity*, including community social capital, past joint planning activities and the potential ability of the community to muster voluntary resources when

needed. Together, we believe these situational factors support an emergency manager's ability to determine whether their jurisdiction is sufficiently prepared for disasters and has the capacity to address them.

### **Risk profile**

A community's risk profile reflects its vulnerability to hazards. Vulnerability is a dimensional construct since it includes different kinds of potential damage (economic, social, ecological), and because some community characteristics will increase vulnerability to certain events more than others (Kumpulainen 2006; McEntire 2005). Vulnerability is also both a subjective and objective construct since perceived threat levels may vary across respondents. From an emergency management perspective, vulnerability can also be viewed as a lack of capacity to perform essential public management functions of planning, resource acquisition, and training (McEntire 2005, 216).

Caruson and MacManus (2007) suggest that emergency management studies address the social dimension of vulnerability, or a community's ability to care for those in the population who depend most heavily on government resources. The social vulnerability index (SoVI) developed by Cutter, Boruff and Shirley (2003) is built on 42 community-level demographic and economic factors. Variables in the index include personal wealth, population age, population density, housing stock, economic vulnerabilities, and race/ethnicity of the population (Brudney and Gazley 2009; Cutter, Boruff, and Shirley 2003; Kumpulainen 2006; McGuire and Silvia 2009). With its emphasis on a community's economic and social health, the SoVI index is a useful construct in reflecting not only the potential level of damage to vulnerable populations but also a community's coping capacity.

Because the SoVI index does not take hazard level into account, experts also suggest that researchers consider the community's level of exposure to potential disasters (Kumpulainen 2006). Geographic, infrastructural and physical characteristics might include a community's floodplain, coastline, proximity of geological faults, presence of chemical or commercial nuclear power plants, and other factors. Such measures have no doubt been developed within local governments, but very little national data exists that are accessible to researchers due to the newness of this field of research and the sensitivity of such data. Below we describe further our efforts to develop a comprehensive index of hazards faced by U.S. communities.

### **Incident experience**

Disaster or incident experience describes the prior emergency events a county has experienced (such as floods, earthquakes, storms, hazardous spills, terrorist attacks, and so on). Such experiences are intuitively understood to help predict an emergency manager's perception of future preparedness. If a county manager has no other information to go on, he or she at least understands from past emergency responses the general effectiveness of current EM plans and resources required. And, if not from personal experience, it is relatively easy for the manager to obtain data on those past disasters, emergencies, and fire events that have at least risen to the level of FEMA support.

## Collaborative capacity

We look at collaborative capacity from two perspectives: a community's social resources, measured through social capital, and a past record of collaborative activity in the EM field. Social capital theory addresses the way in which individuals organize to pursue common goals (Kaufman 1999, 1304). Social capital theory's ability to address a classic collective action dilemma (refusal to cooperate) could be of great use to the emergency management field since it can incorporate the trust, norms and networks that facilitate coordination and the social networks that citizens use to respond to an emergency (Krueger et al. 2009; Putnam 1993; Stewart, Kolluru and Smith 2009). In New Orleans, for example, faith-based organizations led very localized relief efforts that helped citizens maintain their neighborhood attachments (Stewart, Kolluru and Smith 2009).

From a more practical point of view, social capital can also reflect the numbers of voluntary organizations available to support emergency management efforts. Some communities possess the social capital to muster sufficient voluntary resources to provide all the mutual aid they require, and therefore reduce dependence on governmental emergency resources. Even when not explicitly identified as a factor in community social health, social capital is often implicitly credited. In his critique of the "mega-community" approach to solving challenging global problems including major disasters, Blitstein (2008) acknowledges that inter-sectoral relationships, shared resources and trusting relationships can all strengthen community resilience.

Despite the lack of a precise definition of social capital and considerable debate surrounding its essential elements, it is possible to use census, political, and attitudinal data to create indirect measures of social capital. Based on associational activity, socio-demographic characteristics, and voting participation, Rupasingha, Goetz and Freshwater (2006) have constructed the only county-level model of social capital (see also Brehm and Rahn 1997; Putnam 1993). The number of voluntary organizations in a community (churches, unions, sports and recreation clubs, fraternal or professional associations, etc.) has been related to the quality of a community's interpersonal networks, the strength of civic commitments, voting behavior, and even the quality of local government (Kaufman 1999; Putnam 1993).

Collaborative capacity can also be built on collaborative experience. There are at least two forms of collaborative experience common in emergency management: *past joint experience*, or the joint involvement of public and private agencies in disaster simulations or past disasters; and *joint plans*, or the development of memoranda of understanding and other agreements between agencies concerning the provision of human and material resources in the event of an emergency.

Although local governments conduct joint exercises frequently around the nation, Perry (2004) observes that almost no research has examined their scope or impact. Disaster drills, exercises and simulations not only help to test response systems and develop effective disaster plans but also can be mandated once disaster plans are in place (Perry 2004). In both capacities they serve as a means for emergency managers to identify gaps in resources or communication systems, and

also as the principal means by which personnel from various institutions learn to work together. Those personnel who work together regularly in disaster planning can develop strong social bonds, higher trust levels, a common lexicon, and stronger mutual aid plans (Buck, Trainor and Aguirre 2006; Drabek 2003). Perry (2004) finds evidence from a number of prior studies and his own quasi-experimental research that one potential outcome from such exercises is an increase in emergency managers' perceptions of preparedness.

## **Data and Methods**

The National Association of Counties and the Center for the Study of Counties at the University of Georgia's Carl Vinson Institute of Government fielded a national (U.S.) study of emergency preparedness in 2006 through a mailed survey addressed to county emergency managers. This survey was the first to examine at a high level of detail county-level emergency planning activities across the United States. A number of research articles have emerged from this collaborative project involving faculty at several universities (Brudney and Gazley 2009; Krueger et al. 2009; McGuire, Brudney and Gazley 2009; McGuire and Silvia 2009; Clarke 2006).

Responses were obtained from 564 out of 3,066 U.S. counties, representing all Census divisions and 46 of the 50 states. After removing cases with substantial missing data, our sample was reduced for statistical analysis to 407 cases. This sub-sample is geographically representative when compared to U.S. regions, but slightly oversamples at statistically significant levels larger, denser and wealthier counties and coastal counties. Since these variables are used in the analysis, cases have not been weighted. The survey data were supplemented with information obtained from the US Census Bureau and geographic maps.

### **Independent Variables:**

#### ***Risk profile***

**County Population** is both a measure of the resources available to a county and also the level of vulnerability a county must address through threats to its population. County size by population level has been linked to greater expenditures on emergency management budgets (Choi, 2004; Drabek, 2003). We note, however, that disaster events do not necessarily honor geographic boundaries or follow predictable paths (Garb, Cromley and Wait 2007). Although the American Community Survey provides the most current population figures, it does not cover counties with populations less than 65,000. We rely instead on the 2000 decennial Census. Our original dataset also included variables for the percent of the population below the poverty level and the percent over the age of 65. These variables ultimately were dropped from the final regression model due to lack of explanatory power.

**Urban density** is expressed as the percentage of land area that is urban (rather than rural), obtained from the US Census Bureau. **Coastal Land Area** is also obtained from the Census and reflects the percent of land area that is contained in a coastal watershed area as a percentage of

total county land area. The higher the percentage, the greater the flood risk that this county faces.

**Emergencies of concern** are based on survey responses to the question, “What emergencies or natural disasters are the greatest concerns for your county?” Emergency managers rated their level of concern with 24 options, all ranked on seven-point scale (e.g., hurricanes, earthquakes, fires, civil disturbances, landslide, etc; for a complete listing, see Clarke 2006).

The **Social Vulnerability Index** (SoVI) was created by Cutter, Boruff, and Shirley (2003) and has been tested in an emergency planning context by McGuire and Silvia (2009) and Brudney and Gazley (2009). The index uses a principal components analysis to create dimensions of geographic vulnerability related to socioeconomic indicators such as wealth, race, and poverty, and infrastructure indicators such as quality of the housing stock. The resulting index attempts to demonstrate “where there is uneven capacity for preparedness and response” (McGuire and Silvia 2009). The index has not yet been tested widely but offers a comprehensive indicator reflecting a community’s ability to prepare for, respond to, and recover from hazards (Brudney and Gazley 2009). We use the SoVI in this analysis to reflect a higher county risk level, but suggest based on the past published research that it might also be associated with greater collaborative activity.

**The Hazard Analysis Score** is a combined, weighted measure of a county’s history, vulnerability, maximum threat, and the probability of floods, wildfires, earthquakes, tornadoes, hurricanes/tsunami, hazmat/technological events, malevolent/terrorist acts, and snow/ice/extreme cold for a given county. We used readily available statistical and descriptive information and geographic maps to calculate this score using a hazard analysis methodology initially devised by FEMA. This methodology has been refined over the years and is utilized in a variety of forms in current state plans (e.g., Oregon State Emergency Plan, updated May, 2008). For our use, it has been further adapted to accommodate hazards experienced nationwide and to cluster similar hazard categories. Within each hazard category, the history, vulnerability, maximum threat, and probability was estimated on a scale of 1 to 10. This initial estimation, referred to as a severity rating, was valued: low (1 to 3 points), medium (4 to 7 points), and high (8 to 10 points). Each severity rating was then weighted, using a weight factor. The weight factor was borrowed from the original FEMA design, and is as follows: a weight factor of “2” for historical experience; “5” for vulnerability of people and property to an average occurrence; “10” for a maximum threat to people and property under a worst-case scenario; and “7” for the probability of occurrence over time. Each of these are further defined in Table 1. With the weight factor, the minimum score for each is 24; the maximum score is 230. With eight weighted categories, the minimum overall potential score is 192; the maximum overall potential score is 1840. See Table 1 for an example of its application.

### *Incident experience*

FEMA ([www.fema.gov/news/disaster\\_totals\\_annual.fema](http://www.fema.gov/news/disaster_totals_annual.fema)) maintains counts by year, descriptions, and state-by-state breakdowns of **major disaster declarations** (formerly referred to as “Presidential” declarations), emergency declarations, and fire management assistance

declarations. We assigned their locations to individual counties, and created a dummy variable that represented whether or not such a declaration had occurred in the time period 2000-2005 for a given county in any of the three categories. We acknowledge that one disaster, emergency, or fire event may impact more than one county.

### *Collaborative capacity*

**Social Capital** is a composite index created using principal components analysis. The constituent variables include the number of nonprofit organizations in a county, Census participation, and voter turnout, standardized as a per capita ratio (Rupasingha and Goetz 2008).

**Median Household Income** is a capacity measure that serves as an indicator of the wealth of the county and also as a proxy for the size of a county's EM budget (the budget variable was included in the survey but did not yield reliable data; see Krueger, Jennings and Kendra 2009).

**Collaborative EM activity** is based on the amount of **inter-governmental** and **nonprofit** collaboration with county emergency management departments. An aggregate variable, **total collaborative activity**, is also included. Survey respondents indicated which of 15 federal, state, regional or local governmental agencies they worked with on EM needs, or which of four nonprofit organizations (Red Cross, other NPOs, faith-based organizations, hospitals). Joint activities could include mutual aid agreements, memoranda of understanding, informal cooperation, joint planning, training, funding, technical assistance, and equipment sharing, among other options. As McGuire and Silvia (2009) observe, the measure addresses joint activity related to all four phases of emergency management and at both vertical and horizontal jurisdictional levels. The survey results find a moderate to high amount of collaborative activity at the inter-governmental level and a moderate to low amount at nonprofit levels (Clarke 2006).

### Dependent variables

**EM Staff** is a count of the number of EM staff, expressed as full-time equivalents, as reported by county emergency managers on the NACo survey. A logarithmic transformation reduces the effect of outliers. **EM Training** is a count variable reflecting the county EM office's training in up to five areas specific to emergency preparedness: incident command, terrorism response, the National Incident Management System (NIMS), communications, and volunteer resource management. On the NACo survey, each type of training had frequencies exceeding 50% (Clarke 2006).

**EM Plan Uses Volunteers** is a dummy variable describing whether or not volunteer involvement is addressed in the county's emergency planning documents. The variable **Budget for Volunteer Management** is an aggregate of three dummy variables reflecting whether or not a county's emergency plan includes funds for volunteer management, volunteer training, and volunteer mobilization.

The variable **Scope of EM Plans** is an aggregate of three dummy variables describing whether or not a county has an emergency operations plan, a hazard mitigation plan, and an evacuation

plan. The final variable, **Overall EM Preparedness**, is a composite scale based on eight factor-analyzed variables and indices. A detailed description of the measure can be found in Brudney and Gazley (2009). The variable includes responses to survey questions about arrangements for special needs populations, the presence of alerts and shelters, recent drills, the range of EM agreements and rainy day funds, and other public or private resources. This variable also includes managers' responses to a survey question, "To what extent is each of the following prepared for the types of disasters that have hit your county in the past or are likely to affect the county in the future?" Response choices included all major segments of a county, both private and public sector institutions (hospitals, businesses, schools, etc.).

## Findings

Tables 3 and 4 display descriptive statistics and inter-correlations among all variables. Table 5 displays the first half of the model, in which collaborative emergency management activity is tested as a function of county characteristics in our categories of interest: risk profile, incident experience, and collaborative capacity. An OLS regression analysis incorporating nine variables explains about 23 percent of the variance in emergency management collaborative activity. The results suggest that county emergency management collaborative activity at both the inter-governmental and nonprofit levels is strongest in urban areas and counties where emergency managers perceived a higher level of vulnerability to hazards. The effects of all other independent variables are in the predicted positive direction but do not attain statistical significance.

Insert Table 3 here

Insert Table 4 here

Insert Table 5 here

An interesting finding is our discovery of a negative association between social capital and collaborative activity related to emergency management. Past literature on social capital might suggest that this association would be positive. We surmise that the negative association is not because collaborative activity is generally lower in counties with high levels of social capital, but because the social capital index taps geographic differences among the counties that are more important indicators of hazard vulnerability.

One possible explanation is that social capital is highest in suburban areas where associational and civic activity is generally strong but where there is lower concern about how hazards might impact large, vulnerable populations. Another explanation is that county profiles for social capital and for hazards have strong regional characteristics that are quite different from one another. For example, Rupasingha, Goetz and Freshwater (2006) find that the measure of social capital we employ is lower in Southern counties and higher in the Upper Midwest/Northwest. Although we tested regional dummy variables in this model, they did not contribute to explained variation on their own (and did not attain statistical significance) and we removed them from the

final models. But our results still suggest that regional differences matter when it comes to county risk profile and, consequently, to collaborative emergency management activity. We conclude, therefore, that general measures of social capital are not specific enough to pick up collaborative activity that is related to joint emergency planning.

Insert Table 6 here

Table 6 displays both parts of our model, where we test the relationship between various measures of county emergency management capacity and our independent variables in categories related to risk profile, disaster experience, social capital and collaborative activity. In this model, six dependent variables are employed as measures of emergency management preparedness and capacity, related to EM staffing, training, involvement of and funding for volunteers, planning, and managerial perceptions of preparedness. The models return levels of explained variation ranging from fairly insubstantial levels (7 percent for volunteer management budget) to more than one-third (34 percent for staffing levels).

The results of OLS and logistic regression analysis support our argument for a more comprehensive model of emergency preparedness and adaptive capacity, involving both community characteristics related to vulnerability but also variables related to a community's collaborative capacity. Specifically, we see a role for variables from all three of our categories, although some variables have a selective impact on certain dependent variables and not on others. First, a number of variables associated with a county's risk profile predict emergency management, including urban density, amount of coastal land area, a county's vulnerability as measured through the hazard score, and a manager's level of concern about these potential hazards. Specific aspects of emergency management capacity that are positively associated with a county's risk profile include higher staffing levels, training levels, and a manager's greater perception of EM preparedness.

In our second category of interest, the variable assessing past incident experience, measured through major disaster declarations, has a positive association with staffing levels but not with other dependent variables. In the third grouping of variables, those related to collaborative activity have a consistent impact on emergency management capacity. Specifically, collaborative activity predicts greater staffing, training, involvement of volunteers, scope of planning, and perception of preparedness. We find again that social capital has an intermittent, negative association with emergency management capacity.

The social vulnerability index does not have a statistically significant association with collaborative capacity or emergency management capacity in either model. We find in our prior research that the SoVI is associated with the amount of collaborative activity with voluntary organizations, but McGuire and Silvia (2009) do not find the SoVI to be associated with inter-governmental collaboration.

## Summary and Implications

Although scholars approach emergency management programs from sometimes distant perspectives (supply chain management, natural resources management, network management), a common theme in much of the current emergency management literature is the interdependence of community institutions charged with planning, response and recovery. We suggest that research on emergency management can be better informed by examining the interdependence not only of the institutions directly involved in emergency management but also of those community resources and characteristics that might support future collaborative activity.

The present analysis is focused on just one part of a much more comprehensive emergency management framework that we and many other scholars have developed. Effective collaborative emergency management is best understood through a broad review of this active research field. This study's principal limitation is a low response rate. We also observe the general lack of reliable data in this field; in fact, we have included Table 2 specifically to help other researchers locate the data we used since so little county-level data is publicly available.

Our study's theoretical contributions rest first on its ability to connect community characteristics associated with risk level to collaborative managerial activity. In addition, as opposed to most of the research on emergency response, we focus on pre-emergency preparation and planning. Also, although most of the data are cross-sectional, we incorporate historical information from the Census Bureau, NOAA, USGS, and FEMA to strengthen our causal arguments. Empirically, we also offer a rare national sample. The emphasis of the past emergency management literature on case studies and regional studies means that contextual factors are rarely generalizable to larger geographic areas.

There are several practical and theoretical implications to this study that are worth considering in future research. First, from a practical perspective, this comparative analysis helps to identify those risk indicators and experiential events with the greatest ability to predict collaborative emergency planning activity. Given the paucity of data in this field, researchers are looking for guidance on the best measures of emergency management activity. When existing measures are available, our experience with the social capital index suggests that researchers take care to use measures that are relevant to the EM field.

From a theoretical perspective, we identify for the EM field the context within which collaborative emergency management can take place. The general lessons of collaborative public management are thus tested in this specific context. Secondly, our results support an understanding of county emergency management offices as learning organizations that respond to situational factors as they engage in emergency planning. Thirdly, we find a role for both perceived and actual risk in predicting collaborative emergency management and EM capacity levels.

## REFERENCES

- Alexander, Robert and Rosemary O'Leary. 2009. Collaborative approaches to public organization start-ups. In *The Collaborative Public Manager* (Rosemary O'Leary and Lisa Bingham, Eds.), pp. 197-213. Washington, DC: Georgetown University Press.
- Blitstein, Ryan. 2008. An activist manual for the Davos crowd. *Miller-McCune Report* (April-May):74-75.
- Brehm, John and Wendy Rahn. 1997. Individual-level evidence for the causes and consequences of social capital. *American Journal of Political Science*, 41(3):999-1023.
- Brudney, Jeffrey L. and Beth Gazley. 2009. Planning to be prepared: An empirical examination of the role of voluntary organizations in county government emergency planning. *Public Performance and Management Review*, 32(3):372-398.
- Buck, Dick A., Joseph E. Trainor, and Benigno E. Aguirre. 2006. A critical evaluation of the Incident Command System and NIMS. *Journal of Homeland Security and Emergency Management*, 3(3):1-27.
- Caruson, Kiki and Susan A. MacManus. 2007. Designing homeland security policy within a regional structure: A needs assessment of local security concerns. *Journal of Homeland Security and Emergency Management*, 4(2):1-23.
- Choi, Sang Ok. (2004). Emergency management growth in the State of Florida. *State and Local Government Review*, 36(3): 212-226.
- Clarke, Wes. 2006. *Emergency management in county government: A national survey*. Athens: University of Georgia Carl Vinson Institute of Government and the Center for the Study of Counties.
- Cutter, Susan L., Bryan J. Boruff, and W. Lynn Shirley. 2003. Social vulnerability to environmental hazards. *Social Science Quarterly*, 84(2):242-261.
- Drabek, Thomas E. 1986. *Human System Responses to Disaster: An Inventory of Sociological Findings*. New York, NY: Springer-Verlag.
- Drabek, Thomas E. 1987. *The Professional Emergency Manager: Structures and Strategies for Success*. Boulder, CO: Institute of Behavioral Science, University of Colorado.
- Drabek, Thomas E. 2003. *Strategies for coordinating disaster responses*. Boulder: Institute of Behavioral Science, University of Colorado.

Drabek, Thomas E. and Gerard J. Hoetmer. 1991. *Emergency Management: Principles and Practice for Local Government*. Washington, DC: International City Management Association (ICMA).

Dynes, Russell R. and Kathleen J. Tierney. 1994. *Disasters, Collective Behavior, and Social Organizations*. Newark, DE: University of Delaware Press.

Garb, Jane L., Robert G. Cromley and Richard B. Wait. 2007. Estimating Populations at Risk for Disaster Preparedness and Response. *Journal of Homeland Security and Emergency Management*, 4(1):1-17.

Gazley, Beth. 2008. Beyond the contract: The scope and nature of informal government-nonprofit partnerships. *Public Administration Review*, 68(1):141-154.

Hardenbrook, Brandon J. 2005. The Need for a Policy Framework to Develop Disaster Resilient Regions. *Journal of Homeland Security and Emergency Management*, 2(3): 1-23.

Kaplan, Laura G. 1996. *Emergency and Disaster Planning Manual*. New York, NY: McGraw-Hill.

Kapucu, Naim, Maria-Elena Augustin, Vener Garayev. 2009. Interstate Partnerships in Emergency Management: Emergency Management Assistance Compact in Response to Catastrophic Disasters. *Public Administration Review*, 69(2):297-313.

Kaufman, Jason. 1999. Three views of associationalism in 19<sup>th</sup> century America: An empirical examination. *American Journal of Sociology*, 104(5):1296-1345.

Krueger, Skip, Eliot Jennings, and James M. Kendra. 2009. Local Emergency Management Funding: An Evaluation of County Budgets. *Journal of Homeland Security and Emergency Management*, 6(1): 1-21.

Kumpulainen, Satu. 2006. Vulnerability concepts in hazard and risk assessment. In *Natural and technological hazards and risks affecting the spatial development of European regions* (Rphilipp Schmidt-Thome, Ed.). Geological Survey of Finland, Special Paper 42, 65-74.

McGuire, Michael, Jeffrey L. Brudney and Beth Gazley. 2009. The 'New Emergency Management': Applying the lessons of collaborative governance to 21<sup>st</sup> century emergency planning. Forthcoming in R. O'Leary, D. Van Slyke, and S.H. Kim. *The Future of Public Administration, Public Management and Public Service Around the World: The Minnowbrook Perspective*. Washington, DC: Georgetown University Press.

McEntire, David A. 2005. Why vulnerability matters: Exploring the merit of an inclusive disaster reduction concept. *Disaster Prevention and Management*, 14(2):206-222.

McEntire, David A. 2007. *Disaster Response and Recovery*. Hoboken, NJ: John Wiley & Sons.

Mileti, Dennis S., Thomas E. Drabek, and J. Eugene Haas. 1975. *Human Systems in Extreme Environments: A Sociological Perspective*. Boulder: Institute of Behavioral Science, University of Colorado.

Moynihan, Donald P. 2008. Combining Structural Forms in the Search for Policy Tools: Incident Command Systems in U. S. Crisis Management. *Governance* 21(2): 205-229.

Perry, Ronald W. 2004. Disaster exercise outcomes for professional emergency personnel and citizen volunteers. *Journal of Contingencies and Crisis Management*, 12(2): 64-75.

Putnam, Robert D., with Robert Leonardi and Raffaella Y. Nanetti. 1993. *Making democracy work: Civic traditions in modern Italy*. Princeton, NJ: Princeton University Press.

Quarantelli, Enrico L. (ed.) 1978. *Disasters: Theory and Research*. Beverly Hills, CA: Sage Publications.

Quarantelli, Enrico L. 1984. *Organizational Behavior in Disasters and Implications for Disaster Planning*, Monograph Series, Vol. 1, No. 2. Emmitsburg, MD: National Emergency Training Center

Rupasingha, Anil, Stephan J. Goetz, and David Freshwater. 2006. The production of social capital in US counties. *The Journal of Socio-Economics*, 35:83-101.

Rupasingha, Anil and Stephan J. Goetz. 2008. *US County-Level Social Capital Data, 1990-2005*. University Park, PA: The Northeast Regional Center for Rural Development, Penn State University. On the Web at [http://nercrd.psu.edu/Social\\_Capital/index.html](http://nercrd.psu.edu/Social_Capital/index.html)

Solansky, Stephanie T. and Tammy E. Beck. 2009. Enhancing Community Safety and Security Through Understanding Interagency Collaboration in Cyber-Terrorism Exercises. *Administration and Society*, 40(8):852-875.

Stanley, Ellis M., and William L. Waugh, Jr. 2001. Emergency Managers for the New Millennium. In *Handbook of Crisis and Emergency Management*, edited by Ali Farazmand, pp. 693-702. New York: Marcel Dekker.

Stewart, Geoffrey T., Ramesh Kolluru, and Mark Smith. 2009. Leveraging public-private partnerships to improve community resilience in times of disaster. *International Journal of Physical Distribution and Logistics Management*, 39(5):343-364.

U.S. Government Accountability Office. 2008. *Report #GAO-08-369: National disaster response: FEMA should take action to improve capacity and coordination between government and voluntary sectors*. Washington, DC: U.S. GAO.

Waugh, William L. 2009. Mechanisms for collaboration in emergency management: ICS, NIMS, and the problem with command and control. In *The Collaborative Public Manager* (Rosemary O'Leary and Lisa Bingham, Eds.), pp. 157-175. Washington, DC: Georgetown University Press.

Waugh, William L., and Gregory Streib. 2006. Collaboration and Leadership for Effective Emergency Management. *Public Administration Review* 66(s1): 131-140.

Weber, Edward P. and Anne M. Khademian. 2008. Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings. *Public Administration Review*, 68(2):334 – 349.

Wise, Charles R. 2006. Organizing for Homeland Security after Katrina: Is Adaptive Management What's Missing? *Public Administrative Review* 66(3): 302-318.

Table 1. Hazard Score Worksheet						
Anycounty, USA						
Hazards		History	Vulnerability	Maximum Threat	Probability	Score*
		WF=2	WF=5	WF=10	WF=7	
<b>Flood</b>	WF x SF	2 x 10	5 x 9	10 x 7	7 x 10	
	Subscore	= 20	= 45	= 70	= 70	205
<b>Wildfire</b>	WF x SF	2 x 10	5 x 8	10 x 5	7 x 10	
	Subscore	= 20	= 40	= 50	= 70	180
<b>Earthquake</b>	WF x SF	2 x 2	5 x 10	10 x 10	7 x 3	
	Subscore	= 4	= 50	= 100	= 21	175
<b>Tornado</b>	WF x SF	2 x 10	5 x 1	10 x 2	7 x 10	
	Subscore	= 20	= 5	= 20	= 70	115
<b>Hurricane/Typhoon/Tsunami</b>	WF x SF	2 x 9	5 x 10	10 x 10	7 x 10	
	Subscore	= 18	= 50	= 100	= 70	238
<b>Hazmat/Technological</b>	WF x SF	2 x 5	5 x 1	10 x 5	7 x 9	
	Subscore	= 10	= 5	= 50	= 63	128
<b>Malevolent/Terrorist Acts</b>	WF x SF	2 x 1	5 x 1	10 x 1	7 x 1	
	Subscore	= 2	= 5	= 10	= 7	24
<b>Snow/Ice/Extreme Cold</b>	WF x SF	2 x 8	5 x 10	10 x 10	7 x 9	
	Subscore	= 16	= 50	= 100	= 63	229
SF = severity factor (rating/score) (1-10) WF = weight factor					<b>Total Score = 1294</b>	

**Key:** Though nothing is impossible, a score of 2-5-10-7 (24) means that the history combined with the likelihood of the incident is so low as to be reasonably considered impossible. **History** is the record of previous occurrences. Low (1 to 3 points) = 0-1 events in the past 100 years; medium (4 to 7 points) = 2-3 events; and high (8 to 10 points) = 4 or more events in the past 100 years. Weight factor of two (2). **Vulnerability** is the percentage of the population and property that is likely to be affected under an “average” occurrence of the hazard. Low (1 to 3 points) = less than one percent affected; medium (4 to 7 points) = one to ten percent affected; and high (8 to 10 points) = greater than ten percent affected. Weight factor of five (5). **Maximum Threat** is the highest percentage of the population and property that could be impacted under a worst-case scenario. For instance, a direct hit by a hurricane or earthquake generally impacts a broader area and more people than, say, the more surgical strike of a tornado or a hazmat/technological incident. Low (1 to 3 points) = less than five percent affected; medium (4 to 7 points) = five to 25 percent affected; and high (8 to 10 points) = more than 25 percent affected. Weight factor of ten (10). **Probability** is the likelihood of a future occurrence within a specified period of time. Low (1 to 3 points) = one event likely within 75 to 100 years; medium (4 to 7 points) = one event likely within 35 to 75 years; and high (8 to 10 points) = one event likely within 10 to 35 years. Weight factor of seven (7)

Table 2: Summary and Sources of Variable Measures

Type of Variable	Variable Name	Operational Measure	Source
Incident Experience	Major Disaster Declarations	Represents disaster, emergency & fire suppression declarations, 2000-2005 (0/1)	<a href="http://www.fema.gov/news/disaster_totals_annual.fema">www.fema.gov/news/disaster_totals_annual.fema</a>
Risk Profile	2000 County Pop	Total population by county, 2000	Census 2000 Summary File 1 (SF 1) 100-Percent Data, Geographic Area: United States -- County by State
Risk Profile	2000 Median HH Income	Median household income by county, 2000	Census 2000 Summary File 1 (SF 1) 100-Percent Data, Geographic Area: United States -- County by State
Risk Profile	2000 County Urban Density	Percent of urban v. rural, 2000	Census 2000 Summary File 1 (SF 1) 100-Percent Data, Geographic Area: United States -- County by State
Risk Profile	Coastal	Coastal counties are: 1) at least 15% of the total land area located within the coastal watershed; <i>or</i> 2) a portion of or an entire county accounts for at least 15% of a coastal cataloging unit (0/1)	<a href="http://www.census.gov/geo/landview/lv6help/coastal_cty.pdf">www.census.gov/geo/landview/lv6help/coastal_cty.pdf</a>
Risk Profile	Hazard Score Total	Weighted, combined measure of the history, vulnerability, max threat, and probability of eight hazard categories by county	<a href="http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms">www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms</a> ; <a href="http://earthquake.usgs.gov/regional/states/">earthquake.usgs.gov/regional/states/</a> ; <a href="http://quake.usgs.gov/recenteqs/">quake.usgs.gov/recenteqs/</a> ; <a href="http://www.fema.gov/news/disaster_totals_annual.fema">www.fema.gov/news/disaster_totals_annual.fema</a> ; NUREG/CR-6864 (2005), Vols. 1 & 2
Risk Profile	SOVI	National percentile score on the Social Vulnerability Index (SOVI)	McGuire & Silvia (2009); Hazards & Vulnerability Research Institute, <a href="http://webra.cas.sc.edu/hvri/products/sovi.aspx">webra.cas.sc.edu/hvri/products/sovi.aspx</a>
Risk Profile	Emergency of Concern	On a scale of 1 (not at all concerned) to 7 (extremely concerned), respondents rated 24 hazards of potential concern to county.	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Risk Profile	Social Capital	Factored index of nonprofit and civic participation variables	Rupasingha and Goetz (2008)
Collaboration	Total Collaboration		McGuire & Silvia (2009)
Collaboration	Governmental Collaboration	Additive measure of the total number of federal, state, and local entities involved in joint EM action	McGuire & Silvia (2009)
Collaboration	Nonprofit Collaboration	Same additive measure as above for nonprofit collaboration	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a>

			(NACO)
Dependent	EM Staff	Log of total Full Time Employees (FTEs)	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Dependent	EM Training	Count for training of the EM office in five areas: vol resource mgt, communications, NIMS, terrorism response, ICS	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Dependent	EM Plan Uses Vols	Emergency Plan documents use of volunteers (Yes/No; 0/1)	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Dependent	Budget for Vol Management	Count for EM budget in 3 areas: funds for vol mgt, training, and mobilization	<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Dependent	Scope of EM Plan		<a href="http://www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938">www.survey.uga.edu/emergency/p1.cfm?CFID=34322&amp;CFTOKEN=30868938</a> (NACO)
Dependent	Overall EM Preparedness	Factored index of 8 variables:	Brudney and Gazley 2009

Table 3. Descriptive Statistics of All Variables Used in the Analysis

Variable	N	Min	Max	Mean	Std. Deviation
2000 County Population	408	67	9,519,338	162,561.39	557,435.43
2000 County Urban Density	407	0%	100%	49%	0.31
Coastal Land Area (Percent)	407	0%	100%	30%	0.46
Emergencies of Concern	365	0	149	91.07	24.64
Social Capital Index	404	-2.96	9.74	0.05	1.61
Social Vulnerability Index (SOVI)	407	0.10	99.20	48.11	27.48
Hazard Score	406	609	1353	896.10	139.15
Major Disaster Declaration	406	0	1	0.87	0.34
2000 Median Income (Household)	407	\$16,646	\$80,648	38511.07	9737.62
Total Collaborative Activity	408	0	176	36.35	25.50
Inter-governmental Collaboration	408	0	113	24.24	16.99
Nonprofit-EM Collaboration	408	0	42	6.80	5.40
EM staff (FTEs, log)	268	-1.90	5.48	0.82	1.07
EM Training	408	0	5	3.29	1.93
EM Plan Uses Volunteers	359	0 (no)	1 (yes)	0.96	0.21
EM Budget for Volunteer Mgmt	408	0	3	0.85	1.18

Scope of EM Plans	408	0	3	2.24	0.99
Overall EM Preparedness	327	-2.90	2.01	0.00	1.00

Table 4. Inter-correlations Between All Variables Used in the Analysis

	2000 County Pop.	2000 County Urban Density	Coastal Land Area	Emergencies of Concern	Social Capital	SOVI	Hazard Score	Major Disaster Declaration	2000 Median Income	Total Collaboration
2000 County Population	1.000									
2000 Urban Density	.340**	1.000								
Coastal Land Area	.200**	.238**	1.000							
Emergencies of Concern	.151**	.216**	.134*	1.000						
Social Capital	-.164**	-.280**	-.218**	-.107*	1.000					
SOVI	.193**	.134**	.145**	.009	.083	1.000				
Hazard Score	.294**	.307**	.321**	.077	-.375**	.102*	1.000			
Major Disaster Declaration	.069	.025	.020	.037	-.112*	-.044	.206**	1.000		
2000 Median Income	.191**	.490**	.262**	.196**	-.110*	-.219**	.176**	.047	1.000	
Total Collaborative Activity	.201**	.327**	.204**	.394**	-.228**	.045	.225**	-.010	.234**	1.000
Governmental Collaboration	.191**	.315**	.199**	.392**	-.218**	.028	.209**	-.005	.249**	.985**
Nonprofit-EM Collaboration	.220**	.366**	.196**	.353**	-.209**	.056	.222**	.003	.201**	.887**
EM Staff	.302**	.403**	.338**	.131*	-.362**	.084	.375**	.151*	.244**	.256**
EM Training	.075	.126*	-.007	.253**	-.106*	-.050	.146**	-.020	.077	.399**
EM Plan Uses Volunteers	.040	.118*	.062	.147**	-.135*	-.008	.067	.026	.062	.156**
EM Budget for Volunteer Mgmt	.073	.168**	.058	.074	-.151**	-.007	.072	.039	.225**	.246**
Scope of EM Plans	.088	.108*	.103*	.400**	-.123*	.010	.101*	-.088	.007	.391**

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).

Table 4. Correlations Between All Variables in the Analysis, continued

	Inter-govern. Collaboration	Nonprofit Collaboration	EM Staff	EM Training	EM Plan Uses Vols	EM Budget for Vol Mgmt	EM Plans	Overall EM Preparedness
2000 County Pop								
2000 County Urban Density								
Coastal Land Area								
Emergencies of Concern								
Social Capital								
SOVI								
Hazard Score								
Major Disaster Declaration								
2000 Median Income								
Total Collaborative Activity								
Inter-governmental Collaboration	1.000							
Nonprofit-EM Collaboration	.828**	1.000						
EM Staff	.260**	.233**	1.000					
EM Training	.395**	.358**	.188**	1.000				
EM Plan Uses Volunteers	.145**	.141**	.084	.115*	1.000			
EM Budget for Vol Management	.244**	.184**	.273**	.100*	.121*	1.000		
Scope of EM Plans	.379**	.348**	.118	.270**	.146**	.152**	1.000	
Overall EM Preparedness	.394**	.391**	.310**	.125*	.222**	.263**	.645**	1.000

Table 5. Regression Analysis of County Collaboration for Emergencies and Disasters						
Independent Variables	Dependent Variables					
	Total Collaborative Activity		Inter-governmental Collaboration		Nonprofit-EM Collaboration	
	B	Sig	B	Sig	B	Sig
<i>Risk profile:</i>						
2000 County Population (millions)	2.07	0.36	1.26	0.40	0.59	0.21
2000 County Urban Density	<b>13.21</b>	0.01	<b>7.97</b>	0.02	<b>4.38</b>	0.00
Coastal Land Area	1.46	0.60	1.17	0.53	0.20	0.74
Emergencies of Concern	<b>0.32</b>	0.00	<b>0.21</b>	0.00	<b>0.06</b>	0.00
Social Vulnerability Index	0.03	0.57	0.02	0.61	0.001	0.93
Hazard Score	0.015	0.14	0.008	0.24	0.003	0.20
<i>Incident Experience:</i>						
Major Disaster Declaration	-3.39	0.32	1.88	0.41	0.51	0.48
<i>Collaborative capacity:</i>						
Social Capital Index	<b>-1.75</b>	0.03	<b>-1.12</b>	0.04	0.24	0.17
2000 Median Income (millions)	0.2	0.33	0.10	0.20	0.001	0.97

Table 6. Regression Analysis of County Emergency Capacity and Preparedness

N =	360	360	360	360	360	360
Adjusted R <sup>2</sup> =	0.237	0.00	0.23	0.00	0.22	0.00

Independent Variables	EM staff (FTE, log)		EM Training		EM Plan Uses Vols*		EM Budget for Vol Mgmt		Scope of EM Plans		Overall EM Preparedness	
	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig
<i>Risk profile:</i>												
2000 County Population	0.0001	0.08	0.00	0.95	0.00	0.95	0.00	0.86	0.00	0.70	0.00	0.99
2000 County Urban Density	<b>0.86</b>	0.00	-0.07	0.86	1.18	0.36	0.12	0.65	-0.09	0.56	<b>0.61</b>	0.00
Coastal Land Area	<b>0.39</b>	0.00	<b>-0.43</b>	0.05	0.06	0.93	-0.16	0.28	0.04	0.62	0.19	0.11
Emergencies of Concern	0.00	0.76	<b>0.01</b>	0.01	0.02	0.13	0.00	0.45	<b>0.01</b>	0.00	0.01	0.07
Social Vulnerability Index	0.00	0.62	-0.01	0.22	0.00	0.90	0.00	0.61	0.00	0.58	0.00	0.93
Hazard Score	0.00	0.09	0.00	0.04	0.00	0.59	0.00	0.25	0.00	0.13	<b>0.00</b>	0.03
<i>Incident experience:</i>												
Major Disaster Declaration	<b>0.32</b>	0.05	-0.26	0.35	0.41	0.57	0.10	0.59	0.19	0.07	-0.10	0.50
<i>Collaborative capacity:</i>												
Social Capital Index	<b>0.15</b>	0.00	0.03	0.65	-0.15	0.30	<b>-0.10</b>	0.03	-0.04	0.12	0.02	0.62
2000 Median Income	0.00	1.00	0.00	0.89	0.00	0.70	<b>0.00</b>	0.01	0.00	0.20	0.00	0.72
Total Collaborative Activity	<b>0.01</b>	0.03	<b>0.02</b>	0.00	0.04	0.07	<b>0.01</b>	0.00	<b>0.01</b>	0.01	<b>0.01</b>	0.00
N =	249	249	360	360	347	347	360	360	360	360	322	322

Adjusted R <sup>2</sup> =	0.34	0.00	0.14	0.00	0.16**	0.00	0.07	0.00	0.19	0.00	0.22	0.00
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\*Estimates and statistics from Logistic Regression

\*\*Nagelkerke R-Squared