Participation by Emergency Managers in Disaster Response Planning: A Test of Bonding and Bridging Hypotheses

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Abstract

The extent to which regional planning can provide an effective way to resolve emergency planning issues depends upon the commitment and willingness of stakeholders to participate in the planning activities. The social relations developed by managers help resolve the coordination problems that impede planning, but are often difficult to maintain. Without effective monitoring and enforcement mechanisms, the costs of establishing and maintaining interpersonal relations are relatively high The social relations established by emergency managers are important for the emergence of joint activities designed to increase regional planning effectiveness. We propose emergency managers utilize two different strategies to obtain information about the planning activities in the region: Bonding structures create multiple sources for the same information by utilizing direct and indirect sources. Managers embedded in these structures may be less active in regionwide planning, because they strategically establish close contacts with those they believe can provide them with valuable planning information. Alternatively, when managers serve to bridge otherwise unconnected parts of the network, they will be more active participant in regionwide planning activities. We examine these propositions with an analysis of participation by 129 emergency managers in regional partnerships and grant programs designed to promote regionwide emergency planning in the Dallas-Fort Worth-Denton metropolitan area. Our analysis provides strong support for the proposition that involvement in these planning activities is related to the social position of emergency managers in this network. Both bonding and bridging effects have a positive association with emergency manager's involvement in these regional planning initiatives. The evidence is much weaker, however, for the proposition that the social position of the emergency managers is related to the participation by their organizations in these grant programs.

Introduction

The regional approach guiding contemporary emergency management planning activities presents a dilemma to local emergency managers. “On one hand, emergency response requires meticulous organization and planning, but on the other hand, it is spontaneous. Emergency managers have to innovate, adapt, and improvise because plans, regardless of how well done, seldom fit circumstances. Blending these conflicting needs is no easy task.” (Waugh and Streib 2006:132) The fragmented structure of most metropolitan areas in the US further complicates this dilemma. Poorly defined lines of authority, where the responsibility and authority for comprehensive planning in emergency management are often held by appointed and elected officials from different departments and units of government, impede effective disaster and emergency response planning (Waugh, 1994; Patton, 2007; McEntire and Dawson, 2007). Regional planning processes must also overcome political obstacles that lead to strategic and tactical planning that is poorly conceived. The nature of emergency preparedness is that problems are seldom immediate and continuous, and effective emergency planning requires the involvement and sustained commitment of multiple organizations and their personnel (Kiefer and Montjoy, 2006; Waugh and Streib, 2006; Lindell and Perry, 2007).

Yet, even if local emergency managers can overcome the problem of collective action and engage in region-wide planning activities, the benefit of these activities is reduced by the costs of maintaining the collective effort. For instance, in order to integrate and coordinate emergency planning, managers must spend time and energy in emergency training and exercises, and in attending regional meetings and workshops. Yet, it is uncertain whether participating in the joint activities will be useful to the individual participants. Even if the payoffs from effective planning were symmetrical and each jurisdiction would be made equally well off by regional

planning efforts, these activities will be prone to failure if some members of the region are able to secure the benefits for free (Bates, 1998; Ostrom, 1990). Uncertainty about the commitment of the other managers to fully contribute their time, energy, and skills to emergency and disaster planning for the region increases the costs of these efforts.

Understanding this logic permits us to focus on factors that might reduce this uncertainty. High levels of interdependence characterize social relations and this interdependence influences individual participation in organized activities. The social interactions among network members channel information flow and create a structural environment that provides opportunities for or constraints on individual actions (Wasserman and Faust, 1994; Scott, 2000; Monge and Contractor, 2002). From a network perspective, individual participation in joint planning can be explained by the strategic behavior of emergency managers to reduce the cost of information acquisition necessary to make good decisions and implement planned activities. For example, emergency managers establish relations with certain others, trust information they receive only from certain others, and feel obligated to provide information to certain others (Burt, 1997; Granovetter, 1973).

Emergency and disaster response planning is seen as a universal good. More is always better, but emergency managers do not participate equally in these activities. What explains different levels of participation in regionwide planning activities? One explanation is that the emergency managers and the jurisdictions that employ them must strike a balance between collective and individual interests. Participation in regionwide planning activities provides a lens to examine how the different managers strike this balance. As an emergency manager in a region that is vulnerable to disasters and emergencies, there is a collective good from broad participation in regionwide planning actives. Wider participation in these activities is expected to

make the entire region more prepared and better able to successfully respond to major emergencies. However, emergency managers also have an individual interest not expending scarce resources in regionwide planning, because the planned for disasters and emergencies may not materialize. And even if these events do occur, if a sufficient number of the other emergency managers in the region do actively participate in these activities, the region may be able to effectively respond to the emergency. Yet, as pointed out by Moynihan (2009:2), "coordination became more difficult as the number and range of responding organizations increased."

What factors explain the extent to which local emergency managers participate in regional planning activities? Despite calls from practitioners and scholars about the importance of intergovernmental coordination and communication (Kettl, 2002; McEntire and Dawson, 2007), relatively few analysts have systematically explored the variation in the extent to which emergency managers participate in the activities of regionwide planning committees, particularly for emergency mitigation and preparedness planning. We fill this gap through an examination of participation by emergency managers in two specific activities designed to improve emergency planning in the region: participation in regional committees created by local councils of government focusing on emergency mitigation and preparedness planning, and participation in federal grant programs that provide important funding for regional planning efforts.

We propose that the social position of individual managers within a local network of emergency managers affects the incentives the manager has to participate in these initiatives. This is because a person's social position in a network affects his or her ability to obtain vital information and the cost at which this information is obtained. The social relations developed by managers through network relationships help resolve coordination problems, but are often costly to maintain. The network literature suggests two potential strategies for dealing with these costs.

One strategy for gaining access to information from across the network of emergency managers is to establish strong connections to a few close colleagues who have extensive linkages to many other managers in the region. Managers using this "bonding" strategy are expected to be less active in regional planning initiatives because they do need to establish direct links with all others in the region to gain crucial information regarding emergency management activities. Managers may seek this type of role when they want to limit the effort they expend in regional planning activities. A second strategy is to the manager to play a "bridging" role that facilitates the flow of information across the region by linking local networks of emergency managers together. Managers may seek this type of role because they are able to exercise greater control over information about the activities and resources of the different jurisdictions in the region. Also, the status associated with serving in a bridging role will prove useful in an emergency. In both instances, their jurisdiction will be in a better position to respond effectively should a disaster strike their community.

We examine the proposed linkage between the social position of managers in local emergency management networks and participation in regionwide planning initiatives with an analysis of emergency managers in the Dallas-Fort Worth-Denton metropolitan area. The region is a densely populated and highly fragmented region containing nearly six million residents and approximately 200 municipal governments. In 2003, the U.S. Department of Homeland Security (DHS) designated the area as one of several Tier II Urban Areas Security Initiative (UASI) regions. A UASI designation entitles the region to apply for funding from the DHS to support emergency preparedness and response activities unique to the region. We combine information about social position from a network analysis of the emergency managers in the region with survey data indicating the extent of their participation in two mechanisms expected to facilitate

planning on a regionwide basis in the metropolitan area. We focus on the extent to which the managers examined participate in three key planning committees organized by the North Central Texas Council of Governments (NCTCOG), and whether or not their organization participates in selected federal grant programs designed to promote joint planning initiatives.

Our analysis provides strong support for the proposition that involvement in the three planning initiatives is related to the social position of emergency managers in this network. Both bonding and bridging effects are positively associated with the emergency managers' involvement the activities of these regional committees. However, this analysis provides little evidence that the social position of the emergency managers is related to the participation by their organizations in these grant programs.

Linking Social Structure to Participation in Regional Emergency Planning

Scholars are increasingly stressing the importance of collaborative planning in emergency management (Waugh and Streib, 2006; Patton, 2007) and the need for active involvement of elected and appointed officials in the process (Kiefer and Montjoy, 2006; Lindell and Perry, 2007). These scholars contend that minimizing the effect of disasters requires a collaborative planning process whereby potential hazards affecting the region are identified collectively, vulnerability to hazards is assessed, and a consensus reached on how to minimize the effects of these hazards (Lindell and Perry, 2007; Patton, 2007).

There are clear benefits to individual emergency managers from participation in regionwide planning efforts. Emergency managers are motivated to participate in regional planning activities in order to gain access to information related to technical concerns, external funding, and state and federal legal requirements. State and federal requirements are often

complex, and planning activities organized through ad hoc committees, working groups, and trainings exercises can provide managers with important information for organizational decision-making. This, in turn, allows them to develop previously unexplored opportunities together and effectively coordinate their joint efforts.

There are also clear costs to participating in regionwide planning and hazard mitigation. To some extent, the reluctance of local governments to engage in regionwide planning efforts can be explained by the nature of disasters and hazards and the costs involved when planning for mitigation and preparedness strategies. Previous research suggests that emergency management receives limited attention from policy makers because of the high diversity of hazards and disasters; low salience of emergency management as a planning issue; a general resistance to regulation from state and federal governments; and the technical complexity of some regulatory, planning, and response efforts (Waugh, 1990, 1994; Petak, 1985; Cigler, 1999; May and Williams, 1986; Lindell and Perry, 2007). Also, to the extent that local governments are responsible for their own land use planning and building codes, the development of a comprehensive planning program is often difficult to achieve without intervention from regional, state, or federal governments.

The extent to which the involvement of individual managers in regional participation can be explained by interpersonal communications among emergency managers has not been considered in previous work. Unless mandated by the state or federal government, all forms of joint activities involve collective action dilemmas. The costs of establishing and maintaining interpersonal relations are relatively high without effective monitoring and enforcement mechanisms. The problems are particularly acute in the area of emergency mitigation and preparedness since the elements of planning documents are mostly not tested and the level of

commitments are often unrealistic (Auf der Heide, 1989; Kiefer and Montjoy, 2006). Furthermore, the indivisible nature of emergency functions means that exclusion is almost impossible, making it difficult for managers to agree on the level of benefits to be divided or how the costs will be shared.

Self-Organized Network Structures and Communication Patterns

The research literature on social networks identifies two basic structures that we use to explain the motivation of social actors to participate in regionwide emergency planning activities (see Burt, 1997; Nan, 2001; Leonard, 2004). Bonding structures create multiple sources for the same information by utilizing direct and indirect sources. This results from actors making links to others with ties to actors not directly linked to the initial actor. In contrast, bridging structures create paths that most individuals in a network must use to transmit (or receive) information to actors not directly linked to them. This results from a central actor transmitting information to and from actors not directly linked to each other. We propose that both network structures provide insights for understanding the incentives emergency managers have to participate in regionwide emergency planning activities.

Bonding Effects: Building Trust and Information Acquisition

The analysis of bonding relationships typically explain the resulting social structure in terms of the associational benefits of closeness and the increased credibility of information being transmitted between members. The benefits of closeness rest on the extent to which members recognize certain actions or inactions are socially enforceable through group norms, even though they may impose costs to the individuals. Additionally, bonding permits the manager to have

multiple avenues for vital information from actors across the network, thereby reducing the risk of any one of these relationships. For example, in a closely-knit group, the social structure provides extensive monitoring mechanisms, facilitates mutual reciprocity and trust, provides richer information about potential partners, and transforms short-term interactions into repeated games. However, without links to others outside the group, a closely-knit group may suffer from redundancy of information and poor outcomes (Leonard, 2004).

We propose that the use of bonding structures in networks of local emergency managers affects participation in regionwide planning activities in two different ways. First, those managers embedded in bonding structures may not need to participate in regionwide planning activities to obtain information. For the individual manager, the closeness provided by bonding creates opportunities to build the trust, reputation, and credibility necessary to effectively collaborate with other managers to plan for emergencies and disasters. Figure 1 displays a hypothetical network of nine actors. In this network, Actor F connects to actors D, A, and I in three different ways. This redundancy reduces the risk that actors B, E, or G will withhold or otherwise fail to provide the information Actor A needs. By relying on these close contacts, Actor F can obtain needed information at lower costs than by randomly searching the network for those with the necessary information.

However, bonding relationships may also serve to increase participation in regional planning. This possibility stems from the advantages that bonding relationships provide for internalizing a sense of the collective good as an important goal for the group (Coleman 1988; Putnam 1995; Nan, 2001). Kendra and Wachtendorf (2004) argued that when emergency managers feel a strong sense of obligations and duties, they are more engaged in activities that support these values. Involvement in regionwide planning may contribute to the good of the

group because the information gained through active participation in regional planning improves the groups' preparation. Indeed, some argue that interpersonal contacts, close professional relationships, and active participation in regional planning activities make local emergency plans work effectively during disasters (Tierney and Trainor 2004; Moynihan, 2009).

Insert Figure 1 about here.

Bridging Effects: Information Access and Control

The presence of bridging structures has different implications for the flow of information within the network. A manager occupying a central position in a network is able to control information, because the bridge created between otherwise disconnected stakeholders puts the manager in a better position to participate and negotiate in the decision-making processes. This position as information "broker" permits the manager to bargain for his interests and the concerns of his organization and creates an opportunity for the manager to actively shape the information transmitted through the network. Once established, structural bridges can be an important source for information that managers can exploit and utilize. Also, actors serving as bridges have a status in the network that encourages other local managers to pursue connections in order to gain information (Wasserman and Faust, 1994).

We propose that when an emergency manager bridges otherwise unconnected parts of the network, he or she is more likely to engage in regionwide planning. For emergency managers, active participation in regional planning activities provides crucial planning information that he or she can then disseminate through the network. This role allows the manager to utilize these contacts to his advantage, enabling him to push forward his own interests and the concerns of his

organization at the regional level. Returning to figure 1, Actor D is the most important bridging actor in this network. Actor F also plays this role in this network but to a lesser extent than Actor D. It is relatively easy to see that the deletion of either of these actors would substantially change the way information flows through this network. For instance, if Actor D is removed from the network, actors A and F are no longer linked. If this link is used to transmit important information, advice, or other resources critical to planning and responding to emergencies, the loss of Actor D is impedes the ability of A and F to do their jobs effectively. This fact makes Actor D a very important actor in the network (Choi and Kim, 2007).

Description of Data and Research Design

We examine these propositions with a study of emergency managers working in the North Central Texas region. The North Central Texas Council of Governments (NCTCOG) is an excellent setting to examine these questions. Although the focus of the NCTCOG is on routine hazards affecting the region (e.g., severe weather, hazardous materials, large fires, and ice storms), the organization also plays an important role in the NCT region by providing a venue to address collective concerns about emergency planning activities. The NCTCOG facilitates regionwide emergency planning by coordinating monthly meetings for local emergency managers, organizing workshops on funding opportunities, and scheduling training exercises (USGAO ,2004). The NCTCOG's regional planning activities also include preparing and responding to indirect threats from potential hurricanes along the Texas coast. These activities include providing temporary shelters for evacuees, as was the case in the Hurricane Rita and Hurricane Katrina disasters and responding to requests for aid outside the region under the State Mutual Aid agreement.

The local network of emergency managers was identified using a snowball sampling strategy. A list of participants in the NCTCOG-organized Regional Emergency Managers Network was obtained from a source in NCTCOG's emergency preparedness department. Each emergency manager on the list was contacted in November 2007 and asked to name a maximum of three people the manager contacted about emergency management activities. The questionnaires were sent to the 225 managers working for organizations in the NCT metro area. The survey was administered between November 2007 and June 2008, and 126 managers from 100 different organizations returned questionnaires, resulting in a response rate of 56 percent.

Insert Table 1 about here.

Table 1 presents the distribution of the 126 respondents by organizational type. Municipal or county governments employ most of the respondents. Managers employed by the same organization but working in different departments are treated as independent respondents.

Measuring Participation in Regional Emergency Planning

The dependent variables in this analysis are measures of participation in two mechanisms designed to promote regionwide emergency planning in NCT. The first variable is an index developed from responses to the following survey question:

> Regarding regional coordination in the North Central Texas MSA, how actively involved are you in the activities of the following regional partnerships? (1) Emergency Preparedness Planning Council (EPPC); (2) Regional Emergency Preparedness Advisory Committee (REPAC); and (3) Regional Public Information Officer Task Force (RPIOTF).

These three regional partnerships were selected because their efforts are focused on facilitating regional decision making and evaluating local projects to improve joint planning and response. For example, the REPAC has the authority to review, score and rank local project proposals according to Department of Homeland Security (DHS) guidelines. The RPIOTF provides managers with emergency public information and assists in the development of strategies to educate the public about how to prepare for hazards and disasters. Finally, EPPC provides "policy direction and oversight functions to the development and maintenance of a coordinated and integrated regional approach to emergency management planning and response systems" (EPPC, 2009).

Respondents were directed to indicate their involvement in these three regional partnerships in terms of the following scale: 0 (not at all) to 4 (very much). For each respondent, their answers were summed to create a single response ranging from 0 to 12. The summed scores were then divided by 12 to create a highly reliable index (Cronbach's α=.803), ranging from 0 and 1. Higher scores on the index indicate greater involvement in regional emergency planning activities.

A second set of dependent variables measures participation by the respondent's organization in four federally sponsored grant programs that provide funding for joint planning and hazard mitigation projects. The grant programs examined are (1) FEMA Pre-Disaster Mitigation Program, (2) Hazard Mitigation Grant Program, (3) Flood Mitigation Assistance Program, and (4) Hazard Mitigation Planning Program. Funding through these grant programs is more likely when the local governments apply as a regional bloc. This encourages emergency managers to organize joint activities to increase their chances of being funded through the program.[1] More importantly, funding for local projects coming from the DHS are mostly

distributed through the NCTCOG, and participation in these four grant programs provides evidence to DHS and NCTCOG officials that the local government officials are committed to regional efforts to minimize the adverse effects of hazards and emergencies.

Measuring the Social Position of Emergency Managers

The theoretical variables of primary interest in this study are two measures of social position calculated from an analysis of the structure of the communication network revealed by the survey.[2] The indices of actor closeness centrality and actor betweenness centrality are calculated using the centrality routines in UCINET 6.0 (Borgatti, Everett, and Freeman, 2002).

Bonding Effects

The presence of bonding network structures is measured using the actor closeness index (Wasserman and Faust, 1994).[3] This index indicates how quickly each actor can connect to other actors in the network by analyzing the distance of the actor from all others in the network.[4] In this measure, centrality is inversely related to distance. Other scholars, mostly in the strategic management literature, have used closeness centrality to examine similar questions. For example, Soh, Mahmood, and Mitchell (2004) used closeness centrality to analyze the linkage between actor centrality in an inter-firm alliance network and investments in research and development.

The index effectively captures the basic idea of bonding network structures. Intuitively, the lower the number of direct and indirect ties needed to reach all others in the network, the greater the manager's closeness centrality. The actor closeness index is standardized so that the index ranges from 0 to 1, and the index is comparable to centrality measures calculated for other networks (Wasserman and Faust, 1994). Values closer to one indicate the manager is able to

communicate with all the other members of the network more quickly than the other network actors.

Bridging Effects

The presence of bridging network structures is measured using the actor betweenness centrality index (Wasserman and Faust, 1994).[5] This index captures the extent to which the managers in the network are embedded in bridging structures. Other scholars have used betweenness centrality to examine similar questions. Cross and Cummings (2004) used betweenness centrality to assess the linkage between social position and individual performance in knowledge-intensive work. Barley, Freeman, and Hybels (1992) examined the characteristics of firms that led to higher betweenness centrality in strategic alliances in commercial biotechnology industry.

This index effectively captures the basic idea of bridging structures by quantifying the strategic importance of each actor in the network. For each manager, betweenness is based on the probability that the shortest paths between any two other actors pass through them.[6] The actor with the greatest betweenness score has the most influence over what information flows within the network. The actor betweenness centrality index is standardized so that the index ranges from 0 to 1, and the index is comparable to centrality measures calculated for other networks (Wasserman and Faust, 1994). Values closer to one indicate the actor has relatively greater influence over other actors in network.

Control Variables

Finally, the models include several measures to control for variations in the two measures of participation in regional emergency planning activities due to differences in the personal characteristics of the respondents. Variables indicating the respondent's gender, age, amount of experience in the emergency management field, and if he or she has an undergraduate degree in emergency management are included in each model. We also included a dichotomous variable indicating if the respondent is employed in a municipal government agency. The control variables are included in the models because of a widespread recognition that these factors may affect the participation by emergency managers in these regional activities. However, in the analysis that follows, we limit our interpretation and discussion to the findings for the two theoretical variables indicating bonding and bridging network structures. Table 2 provides descriptive statistics and a brief description of the measure for each variable in the model.

Analysis and Discussion

Tables 3 and 4 present the findings of the analysis. The model examining the index of participation in the three regional partnerships is estimated using OLS regression and the findings are presented in Table 3. The analysis of participation by the respondents' organizations in the four federal grant programs is presented in Table 4. The participation measures in this case are dichotomous variables and the models are Probit estimations.

Insert Table 3 about here.

We begin with the model examining the index of the respondents' reported involvement in the three major NCTCOG committees devoted to encouraging and coordinating emergency and disaster planning and response in the region. As predicted, those actors with larger betweenness centrality scores reported statistically greater involvement in the activities of these committees. We proposed that these managers would have a strong incentive to be involved in the work of these committees because the information gained is useful in their bridging role. This analysis confirms this proposition.

The analysis reveals a similar pattern for the relationship between bonding structures and participation in the activities of these regional planning committees. Those actors with higher closeness centrality scores also reported statistically greater involvement in the activities of these committees. We proposed that actors with higher closeness centrality would be less active in regional planning activities because they could rely on others to provide this information to them. However, we noted an alternative expectation for the effect of bonding relationships provides a basis for expecting increased regional activity. Kendra and Wachtendorf (2004) argued that when emergency managers feel a strong sense of obligations and duties, they are more engaged in activities that support these values. Involvement in regionwide planning may contribute to the good of the group because the information gained through active participation in regional planning improves the groups' preparation. Our findings provide more support for this explanation of the effect of social position.

Insert Table 4 about here.

The findings for participation in the four grant programs are much weaker. The findings presented in Table 4 shows that the bridging effect is statistically significant in only one model and the bonding effect is not significant in any of the models. The signs of the two coefficients are consistent with our predictions in virtually every model, but only in the case of the FEMA Pre-Disaster Mitigation program does a coefficient (the bridging effect) achieve statistical significance. These four models provide little evidence that the social position of emergency managers is related to the participation by their organizations in these grant programs.

Implications and Conclusions

According to Harris and Clements (2007), regional and local planners spend 50 to 100 percent of their time on activities related to emergency planning. Although elected officials and local managers generally have some links to regional planning organizations, these connections may often be largely symbolic. Nevertheless, involvement in activities sponsored by COGs is important for emergency managers. An essential element of effective planning for disasters is the ability to get crucial information in order to make good decisions (Comfort, 1988). During mitigation and preparedness planning processes, managers can reduce the potential for negative consequences of disasters by identifying potential hazards through the assistance of other expertise. The support services provided by COGS allow managers to articulate their concerns, verify the feasibility of planning strategies, and guide them on technical issues related to regulations and standard operational procedures often mandated by state and federal governments (LeRoux, 2008; Wolf and Bryan, 2009).

The effectiveness of regional emergency planning depends on the level of participation by local managers in regional committees or working groups composed of experts from local

governments. These managers often “play for the team” in regionwide activities, serving either as coordinators or facilitators of these activities. Members’ involvement, although varying across a region, generally attempts to resolve regionwide concerns in which information is circulated, scientific studies are conducted, and policies formulated. As representatives of local governments, manager roles extend beyond the simple material dissemination to influencing planning activities of other local governments. They aim to manage the distribution of tasks, to coordinate the implementation of regional policies, and to advise members of the essential aspects of planning. In order to comply with state and federal policy and mandates, the effectiveness of COGs depends on the level of support of local governments and the credibility of their managers to implement concrete policy and planning objectives at the local level.

Despite calls from practitioners and scholars about the importance of intergovernmental coordination and communication (Kettl, 2002; McEntire and Dawson, 2007), relatively few analysts have systematically explored the variation in the extent to which emergency managers participate in the activities of regionwide planning committees, particularly for emergency mitigation and preparedness planning. Network analysis provides an excellent analytical tool to examine this question. Network analysis is based on the assumed importance of relationships or interaction among key actors rather than physical position or personal attributes such as race, class, and gender. It emphasizes the importance of relational concepts and processes defined by a set of connections among actors.

This study provides strong support for the proposition that involvement in these regional planning activities is related to the social position of emergency managers in this network. Both measures of bonding and bridging effects show a positive association with participation by these managers (or their organizations) in these regional planning initiatives. The evidence is much

weaker, however, for the proposition that the social position of the emergency managers is related to the participation by their organizations in these grant programs. Some of this weakness in the findings for this measure of participation might result from underspecification of this model. We note that the basic empirical model used in this study is clearly better for explaining involvement in the regional planning activities of these councils than it is for explaining grant applications to the four federal programs.

This paper is an initial effort to examine the role social position plays in the extent to which local emergency managers participate in regional planning activities. We will refine these models as we continue in our effort to examine this important question.

Notes

[1] The Department of Homeland Security has designated the NCT region as an Urban Areas Security Initiative (UASI) region. UASI requirements mean that financial assistance is less likely for jurisdictions unless their emergency managers work with each other on joint funded projects.

[2] This network is represented by a 126 by 126 square matrix reporting all ties among the 126 emergency managers. The entry i, j equals 0 if actor i has no ties with actor j, or 1 if either i or j indicated the presence of a relationship between the two managers. The network examined in this study is a fully connected network. All 126 actors are connected to at least one other actor in the network.

[3] An actor's normalized closeness centrality is one divided by the actor's "farness" distance to all the other actors. As the actor's total "farness" increases in length, his closeness centrality decreases. An actor's closeness centrality is formally written as: Let $d(n_i, n_j)$ be the number of ties in the shortest path connecting actors i and j. The total distance that actor i is from all other actors can be defined as $\sum_{j=1}^{g} d(n_j, n_i)$, where the sum is taken over all $j \neq i$ (Wasserman and Faust, 1994). The index depends on the size of a network, g. This is a formal way to express the first stage of calculating actor's closeness centrality index. In the second stage of the estimation, as per Sabidussi (1966), the closeness centrality index is expressed as the inverse of the sum of the distance from actor i to all other actors: $C_C(n_i) = \left[\sum_{j=1}^{g} d(n_i, n_j)\right]^{-1}$. The actors in the hypothetical network in figure 1 provide an example of how the measure is calculated. The length of the shortest path that actor E must take to reach each of the actors A, C, H, and I is 2 steps. Actor E also needs 1 step to reach each actor B, D, G, and F. The total number of shortest paths for actor E to reach each of the other actors is 12. Since (g -1) = 8, E's closeness centrality is .6667, or 66.67, when expressed in percentage terms.

[4] The closeness centrality measure is meaningful only for connected graphs. An actor is said to be reachable from another actor if there is a path linking the two actors; otherwise, the actors are not reachable from each other. A reachable path may be based on direct connection or on connections that flow through other actors. All 126 emergency managers are connected in this network.

[5] The actor's betweenness centrality index is formally written as $C_B(n_i) = \sum_{j<k} g_{jk}(n_i) / g_{jk}$, where g_{jk} is the number of the geodesics connecting the two actors, and $g_{jk}(n_i)$ is the number of geodesics connecting two actors through another actor, often called a "broker" (Wasserman and Faust, 1994). Again, the actors in figure 1 provide a means to illustrate how this index is calculated. Actor D has the highest betweenness index (47.62) because it acts as a bridge between actors A and I who otherwise would have been disconnected from the rest of the network.

[6] This probability is then divided by the total number of possible connections involving the other actors (Freeman, 1979).

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Table 1
Respondents by Types of Organizations

Organizational Types	Returned Surveys	
	Frequency	**Percentage**
Municipal Government:		
Emergency Management Department	38	31
Fire Department	41	32
Police Department	2	1
County Government	25	20
Special District	3	2
Council of Government	5	4
State Government	3	3
Federal Government	4	3
Non-Profit Organization	3	3
University	2	1
TOTAL	126	100%

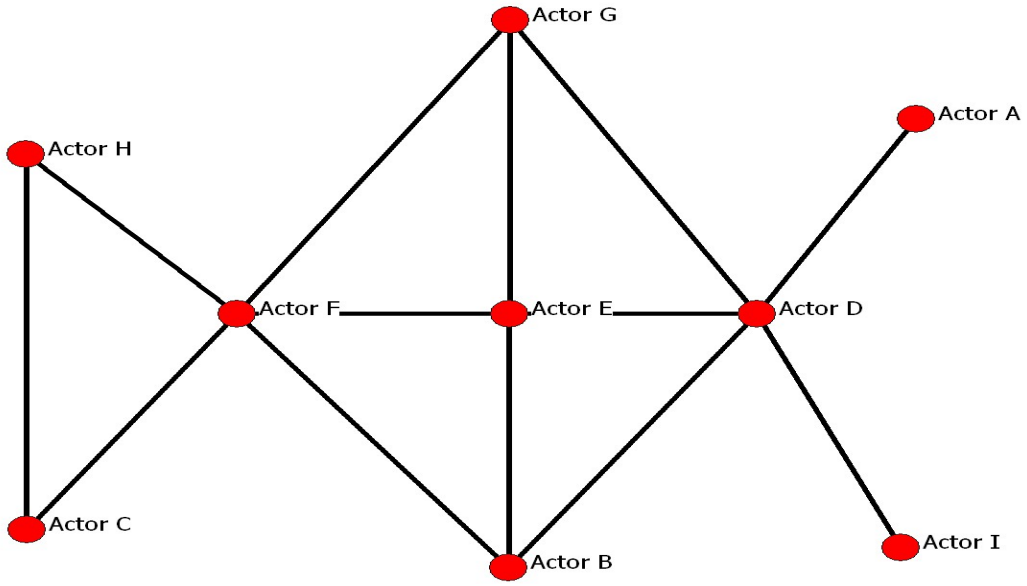

Figure 1
Hypothetical Network of Nine Actors

Table 2
Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
NCTOG Committee Involvement Index	124	.45	.29	0	1
FEMA pre-disaster mitigation program (Yes=1)	116	.32	.468	0	1
Hazard mitigation grant program (Yes=1)	115	.37	.485	0	1
Flood mitigation assistance program (Yes=1)	112	.29	.454	0	1
Hazard mitigation planning grant (Yes=1)	115	.49	.502	0	1
Actor Betweenness Centrality (Bridging Effect)	117	.0179	.0283	0	.1663
Actor Closeness Centrality (Bonding Effect)	117	.0246	.0074	.0053	.0282
Gender (Male=1)	126	.83	.37	0	1
Age (logged)	115	1.64	.11	1.36	1.82
Years in emergency management (EM) field	126	10.85	9.29	1	43
Undergraduate Degree in EM field (Yes=1)	126	.46	.50	0	1
Municipal government employee (Yes=1)	126	.64	.48	0	1

Table 3
Involvement in NCTCOG Regional Emergency Planning Committees

	Parameter Estimates	Standard Errors
Actor Betweenness Centrality (Bridging Effect)	.03***	.008
Actor Closeness Centrality (Bonding Effect)	.07**	.034
Gender (Male)	-.05	.072
Age (logged)	-.84***	.302
Years in EM field	.01*	.005
Undergraduate in EM	.12**	.056
Municipal Government Employees	.02	.053
Constant	1.55***	.496
Number of Observations = 105		
F-value = 9.16***		
Adjusted R-square = .36		
Mean VIF = 1.33		

Note: *p<.10; ** p<.05; *** p<.001

Table 4
Participation in Federal Emergency Mitigation and Planning Grant Programs

	Federal Grant Programs			
	FEMA pre-disaster mitigation program	Hazard mitigation grant program	Flood mitigation assistance program	Hazard mitigation planning
Actor Betweenness Centrality	.15*	.10	.08	.15
(Bridging Effect)	(.083)	(.079)	(.077)	(.101)
Actor Closeness Centrality	-.21	.03	-.15	-.13
(Bonding Effect)	(.321)	(.328)	(.327)	(.304)
Gender (Male)	-.43	.69	1.36*	.85
	(.693)	(.733)	(.789)	(.705)
Age (logged)	-3.78	-5.96**	-9.13***	-6.93**
	(3.00)	(3.16)	(3.37)	(3.02)
Years in EM field	.03	.02	.03	.04
	(.027)	(.027)	(.028)	(.025)
Undergraduate in EM	.57	.94*	-.29	.05
	(.549)	(.54)	(.577)	(.519)
Municipal Government	.69	.91*	.36	.22
Employees	(.547)	(.546)	(.544)	(.495)
Constant	5.09	7.19	12.75**	10.16**
	(4.911)	(5.07)	(5.37)	(4.87)
Number of Observations	99	98	96	98
LR Chi-square	12.30*	17.97**	12.30*	12.63*
Pseudo R-square	.10	.14	.10	.09
Proportional Reduction in Errors	69.70%	67.35%	68.75%	60.20%

Note: *p<.10; ** p<.05; *** p<.001; Standard errors in parentheses.