

The Evolution of Emergency Management Networks: A Multi-Modal Assessment of Two Evacuation Hosting Networks from 2000-2009

Scott E. Robinson - Bush School, Texas A&M University
Warren S. Eller - University of North Carolina - Pembroke
Melanie Gall - Louisiana State University
Brian J. Gerber - University of Colorado - Denver

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Abstract

Emergency management is a field in which collaborative activities are inescapable. Emergency planning and response increasingly involves a diverse array of actors across fields (emergency management, public health, law enforcement, etc.), sector (government, non-profit, and for-profit), and level of government (local, state, and federal). The necessity of collaboration is built into the logic of escalation in the Stafford Act and the nature of emergency events as boundary spanning threats. While the necessity of collaboration is clear, the dynamics of this collaboration are less well understood.

This paper assesses the temporal dynamics of emergency management networks in two moderately sized communities that have served as evacuation hosting sites in the past decade. The paper uses two strategies for tracking the evolution of these networks across time. First, we develop an annual network map using newspaper and newswire data sources. Second, we develop a view of the evolution by analyzing emergency operations plans for each community.

Analysis of data from these two strategies reveals biases built into each method. The media data include a wide variety of actors, many of whom do not persist through the time period. The formal plan data include only a small number of actors who largely persist throughout the time period. What is not clear is which of these images of the networks is more accurate. The paper concludes with a discussion of the difficulty of mixed methods network research.

1 Introduction

Public administration and political science are currently focusing quite a bit of attention on issues related to political and administrative networks.¹ The Public Administration Review devoted an entire special issue to the subject in 2005 and the American Political Science Association created a specialized organized section on the subject of political networks. While attention to collaborative public management and policy networks is high right now, this is by no means a new subject. The classic argument of the dominance of iron triangles or policy whirlpools is a network argument - albeit of a small network (Redford 1969). The counterargument that policy tends to involve broad and fluid participation in issue networks is also rather obviously a network construct (Hecl 1978). More recent integrations of the literature positing changing levels of participation over time and across policy areas suggest that these networks can evolve over time as characteristics of individual policy domains change (McCool 1998, Sabatier & Jenkins-Smith 1993).

While attention to issues of administrative and policy networks has been a component of the policy literature for decades, the dynamics of the networks across time has proven to be a difficult subject to study. Due to extraordinary demands on data and the necessity of novel inferential techniques for data involving networks, very little work has engaged issues related to network change. This paper represents an initial (and tentative) step toward assessing the evolution of emergency management networks across time - in this case over a decade involving two major events. The next section (Section 2) will discuss some of the existing literature on issues related to the incorporation of new actors into a policy network and the evolution of network characteristics over time. The result will be a series of propositions about the nature of emergency management network change. Section 3 will introduce two approaches to measuring membership and relationships within policy networks. Sections 4 and 5 report on the roster of emergency management networks in two communities for each of the two measurements strategies discussed in 3. Finally, Sections 6 and 7 discuss the implications of these re-

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sults for the study of emergency management networks and the measurement of administrative networks generally. Section 8 concludes.

2 The Evolution of Emergency Management Networks

A central question of research into policy and administrative networks is the scope and fluidity of participation. The key characteristic of policy subsystem approaches to networks was the emphasis on closed and limited participation by predictable actors (e.g. congressional subcommittees, interest groups, and agencies). The principal critique of the argument was that participation in actual policy domains tends to be much more broad and fluid. It was argued that a large variety of actors may participate within any policy network including those envisioned by subsystem theories as well as representatives of other levels of government and even public interest groups. Furthermore, the participation level of various actors is thought to change over time with some actors dropping out of active participation while new actors emerge at different time. An issue network represents an extreme version of this open and fluid network (Hecl 1978). A key question, then, is the scope and fluidity of participation in actual policy networks. The next subsection will discuss the issue of participation in emergency management networks specifically. Following that discussion, I will discuss some specific propositions from the literature regarding the evolution of emergency management networks.

2.1 Networks and Emergency Management

Over the past two decades, the importance of collaborative networks has become clear to scholars specializing in emergency management. Emergency management represents a classic wicked problem (O'Toole Jr 1997). Emergencies tend to cross jurisdictional boundaries due to the geographic scope and the broad range of consequences they present. For example, Hurricane Katrina devastated communities across multiple states and mobilizing reactions from a variety of government agencies (emergency management, law enforcement, transportation, public health, housing and welfare, etc.) and nongovernmental agencies (the American Red Cross, Walmart, local religious institutions, etc.) (Simo & Bies 2007).

Among the most prominent voices for research into collaboration and networking activities in emergency management has been Louise Comfort. Comfort has argued that emergency management networks are best understood as self-organizing systems (Comfort 1994). The emphasis in her account is fluidity of participation and the inability to predict mobilizations *ex ante*. Rather than following documented plans or stable expectations, mobilization tend to involve an unpredictable set of actors that vary greatly in terms of prior disaster experience, organizational sector, and other characteristics.

Concluding that mobilization is unpredictable is unsatisfying in a number of ways. First, it suggests that efforts to plan mobilizations are doomed to failure. If one can not predict who will be involved - at least in terms of some core players - then one can not know whom to involve in emergency planning. Second, to the extent that exercises and other simulations are key preparatory (and possibly even evaluative) elements of emergency management, if one can not predict who will mobilize following an emergency event then one will not know who to include in an exercise. The limited composition of exercises preceding Hurricane Katrina has been identified as a key cause of the eventual problems in evacuating residents of New Orleans with limited access to transportation (Kiefer & Montjoy 2006).

However, the difficulty in predicting which organizations will mobilize in an emergency may have been overstated. In a study of the mobilization of evacuation hosting activities in the Dallas/Fort Worth, TX area following Hurricane Katrina, Robinson, Berrett & Stone (2006) found that the mobilization of many organizations was predictable given a series of prior relationships. Relationships that sometimes had little to do with emergency management and evacuation hosting activities served as a basis for the emergence of a series of response networks. While there was also evidence of spontaneous mobilization of organization with no prior membership in emergency management networks, a good part of the network - particularly the network leadership - involved prior relationships that could easily escape the attention of emergency management scholars. The case studies collected in this article provide some hope that relationships can be managed and that mobilizations can be predicted (within some bounds).

The complexity of the mobilization and management process of emergency management networks has raised important questions about the management and leadership of these networks. Waugh & Streib (2006) argued that coordination is difficult within emergency management networks despite recent attempts to provide structure to the networks through such devices

as the National Incident Management System (NIMS) and the Integrated Command System (ICS). The difficulties in leadership are accentuated given the diversity of these networks. Actors from diverse sectors and policy areas bring with them a variety of assumptions about the nature of emergencies and appropriate forms of coordination and communication(Comfort 2007).

2.2 Propositions for Network Evolution

Given the importance of network collaboration to issues of emergency management, research into the development and evolution of these networks is essential to the improvement of management of emergency preparedness and response networks. This paper will focus on expectations surrounding the key characteristics that distinguish subsystem models from issue network models of policy networks: scope of participation and fluidity of participation.

In terms of scope of participation, there is no bright line distinguishing high from low levels of participation. We will instead focus on volatility in network rosters with modest attention to network size. As another contrast, while most of the research has been at the federal level of policy making complicating predictions at local levels, we will instead focus on volatility of networks within this sample of small, local jurisdictions.

Proposition 1 *Emergency management networks will experience volatility in membership.*

Volatility can take on a number of meanings. One can experience volatility in network roster. However, involving different organizations may not be as important as increasing representation from diverse types of organizations. While we could focus on a number of types, we will focus on representation of policy sectors (e.g. emergency management, law enforcement, education, public health, etc.) and private sector organizations. This focus results in two specified propositions.

Proposition 2 *Emergency management networks will experience volatility in network membership.*

Proposition 3 *Emergency management networks will experience volatility in network diversity (in terms of policy sector representation).*

3 Data

Testing these propositions requires data with a particular set of characteristics. The dataset must record participation within emergency management networks. Furthermore, the observations must be ordered so that a time path is clear. Ideally, the time path should record participation over a number of years, preferably at least a decade (Sabatier 1993). Hypothetically, one could conduct interviews or surveys annually over a decade but such efforts are incredibly expensive and are predictably rare. The twin needs of comparable measurement and available data across time are best (or at least, easiest) served by documentary analysis. This paper will focus on two types of documentary sources: media reports of evacuation related activity and formal emergency operations plans related to evacuation.

To collect these data, we located six comparable communities. We were interested in evacuation hosting activities so we identified communities that had recent (within the last decade) experiences with evacuation hosting activities. We also chose communities that were relatively similar in terms of population size. For this reason we chose moderately sized communities rather than the largest cities where the variances in size are large in absolute terms. The six communities have populations between 200,000 and 1 million residents (when not hosting evacuees) and include four communities from Gulf Coast states and two from non-Gulf Coast states. This paper will focus on two Gulf Coast communities: Brazos County, Texas and Caddo/Bossier Parishes, Louisiana.

3.1 Media Reported Networks

For our first data source, we have selected to use newspaper searches to generate a database of media documents. Our goal was to create a single system for collecting journalistic coverage of emergency management networks that could be used for a variety of communities across time. For purposes of this study, we are focusing attention on evacuation related activities (within the entire realm of emergency management). We elected to search within the Westlaw database using the substantive search term “evac!”. This will capture all words that begin with the letters “evac” including evacuation, evacuate, evacuee, and the like. The Westlaw database allowed us to search all newspapers and news wires - to ensure we captured local as well as national media sources. We added geographic limiters to the substantive search term

including the major cities and the county in which the community resides. For example, we looked for articles that included a term starting with “evac” and also included either “College Station”, “Bryan”, or “Brazos County.” Given the varying roles that county and city officials play in emergency management, we felt it was essential to search based on city and county. This paper reports the results of document searches related to Brazos County, TX (which includes the cities of College Station and Bryan – about 1.5 hours northwest of Houston) and Caddo and Bossier Parishes, LA (including the city of Shreveport). The use of media reports to reconstruct networks was inspired by Comfort’s (2006) study of response networks to Hurricanes Katrina and Rita.

These searches of the Westlaw database resulted in hundreds of hits for each year of our sample (2001-2009). For the purpose of this analysis, we will aggregate the media reports into two periods: 2000-2005 (up to and including Hurricane Katrina) and 2006-2009 (post-Hurricane Katrina through Hurricanes Gustav and Ike). Each of these articles were then read individually to ensure that the article was germane to issues of evacuation. This eliminated many articles. Some articles included references to entertainment or sporting events in the target community (such as Texas A&M University sports teams) and coverage of something having to do with an evacuation in a different community. We only selected articles that involved an evacuation or evacuation hosting activity within the target community. We then read each of the selected articles to identify all organizations mentioned.

3.2 Plan Based Networks

To complement the media reports, we have also collected formal emergency operations plans from each of these communities. The emergency operations plan serves as a primary coordinating document for a variety of actors in emergency management within each community. The document lays out the structure of authority and responsibility as well as providing an assessment of locally prominent hazards and specific annex documents for a variety of detailed functions.

We have coded each formal emergency operation plan to create a roster of formally included members of the emergency management network within each community. While the media reported network is a permissive sample that includes a wide variety of actors, the formal plans tend to have much smaller rosters and focus on organizational with legally defined responsibili-

ties within emergency management. Where possible, we have collected historical plans as well as the currently operations emergency operations plan. Interestingly, few of the emergency management offices within our communities kept historical plans. When a new plan was formally approved, the old one was discarded without a copy being kept in the office. Where we have found historical plans, it has been through the use of the web archive service “The Wayback Machine” at web.archive.org.

4 Brazos County, TX Results

Brazos County lies approximately 1.5 hours (by car) Northwest of the Houston metroplex and has been involved in two major evacuation efforts: one in 2005 (including Hurricanes Katrina and Rita) and one in 2008 (including Hurricane Ike). Additionally, there was a notable local evacuation in 2009 stemming from a release from a chemical plant. This local evacuation was limited in duration but resulted in an evacuation order for most of the city of Bryan.

4.1 Media Reported Networks

The media reported networks for Brazos County are diverse and extensive – with the active involvement of units of the Texas A&M System. We will look at each of these rosters in turn. For each roster, the members in red uniquely appear in that particular time period. For example, the EPA was mentioned in media accounts of evacuation efforts in Brazos County in the 2000-2005 but not in the later window. By comparing the organizations listed in black to those listed in red, you can see the types of organizations that persist through the period and those that do not.

4.1.1 2000-2005

The media reported network roster for 2000-2005 is reported in Figure 1.

The diversity of policy domains and organization types is remarkable. Public health, transportation, environmental quality, and housing oriented organizations are all part of the media-reported networks. Furthermore, there is diversity in terms of organization type. The government, nonprofit, religious, and private sectors are all represented on the roster.

Figure 1: Brazos County 2000-2005 Media Report Membership – unique elements are in **red** and persistent elements are in **bold**.

- **Texas A&M University**
- **Army AF Instr. School**
- **TX Agg. Youth Camp**
- **Texas Engineering Extension Service**
- **FEMA**
- **Hazard Reduction and Recovery Center**
- **Lake Jackson Civic Center**
- **TX DOT**
- **Texas A&M SRPH**
- **EPA**
- **TX Nat. Res. Cons. Comm.**
- **American Red Cross**
- **TX Department of Health**
- **NOAA**
- **National Hurricane Center**
- **FBI**
- **TX DPS**
- **TX General Land**
- **Texas Parks and Wildlife**
- **Nat. Coun. on Rad. Prot.**
- **TTI**
- **Em. Prep. Inst.**
- **DHS**
- **DoJ**
- **Exxon Mobil's Fire School**
- **TAMU Coop. Inst. for Appl. Meteorological Stud.**
- **Offshore Tech. Research Center**
- **TX National Guard**
- **National Severe Storm Lab**
- **National Weather Service**
- **American Red Cross**
- **Bryan High School**
- **Tulane University**
- **Real Estate Center at TAMU**
- **Lakeview Methodist Con-**
- **TAM Health Science Center**
- **La Quinta**
- **S. TX Council of the Boy Scouts**
- **SBA**
- **HUD**
- **Habitat for Humanity**
- **Texas City Prairie Preserve**
- **UNO**
- **Houston Chronicle**
- **Aggie Guide Dogs and Service Dogs**
- **Southeastern Library Network**
- **TX Board of Health**
- **TAM Galveston**
- **TX Oil and Gas Association**
- **TX Tank Carriers Association**
- **TX Petro. Marketers and Conven. Stores**
- **Exxon Mobil**
- **Association of**

It is also interesting that emergency management organizations, while present, are not particularly prominent on the list. Curiously missing are the county and city emergency management organizations. State and federal emergency management organizations are present, but not the local offices. It is hasty to conclude from this exclusion that the county and city emergency management offices were not active and important. However, their operations were missing from media accounts of the activities.

4.1.2 2006-2009

The second time period covers the post-Katrina/Rita period that included another major hurricane evacuation (related to Hurricane Ike in the East Texas area) and a local evacuation related to a chemical release (at the El Dorado Chemical Plant). The media reported network roster is presented in Figure 2.

Again university units are prominent and persistent along with a handful of other organizations. In this later period, local fire and emergency management organizations make it into the media reported network. The diversity of policy domains is still remarkable - though, often, the specific representatives changes. For example, the EPA drops out during this time period but the TCEQ (the state equivalent to the EPA) enters. This raises an interesting question for studies of policy networks. How important is persistence of specific organizations within a network to ensure that a specific perspective (like, say, the importance of environmental issues) to be present within that network?

There are persistent members for a variety of policy domains including transportation (TTI) and health (with a variety of public health and hospitals represented). The specific members of the nonprofit, religious, and private sectors changed considerably in this period - but the substantial presence of each sector did not.

The aggregation of the media networks to 5-6 year increments masks a great deal of annual variation. Within this time period, the number of organizations varied from 3 (in 2000) to dozens (in 2005 and 2008). This represents clear variation in network size on an annual basis. In reference to our propositions, the media reported networks provide evidence for variation in network membership and diversity of network participant organization type.

Figure 2: Brazos County 2006-2009 Media Report Membership – unique elements are in **red** and persistent elements are in **bold**.

- **TAMU**
- **TX Engineering Extension Service**
- **National Hurricane Center**
- **Tulane University**
- **TAMU Galveston**
- **Center for Retailing Studies**
- **College Station Fire Department**
- **University Police Department**
- **Env. Health and Safety Department**
- **TAMU Physical Plant**
- **Community EOC**
- **Hazard Reduction and Recovery Center**
- **TAM HSC Office of HS**
- **Atmos Energy**
- **TAM Center for Homeland Security**
- **Texas Homeland Security**
- **FEMA**
- **TX DOT**
- **American Red Cross**
- **TTI**
- **TX National Guard**
- **National Weather Service**
- **TAM HSC**
- **A&M United Methodist Church**
- **Plaza Hotel**
- **Christ United Methodist Church**
- **Blood Center of Brazos Valley**
- **St. Joseph Reg. Health Center**
- **CS Medical Center**
- **Brazos Valley Physician's Organization**
- **Carter Blood Care**
- **BCS Conv. Center**
- **US Public Health Services**
- **Teaching, Learning, and Culture Department - TAMU**
- **Brazos County Food Bank**
- **Brazos County Council of Government**
- **Texas Hotel and Lodging Association**
- **Texas Public Power Association**
- **Texas Task Force 1**
- **Bryan HEB**
- **CS Wal-Mart**
- **Bryan Fire Department**
- **Roberston County EMS**
- **El Dorado Chemical Company**
- **Grace Bible Church**
- **Bryan Police Department**
- **TCEQ**

4.2 Plan Based Networks

We also collected rosters for the emergency management and mass care / sheltering from official emergency plans. This data source, while also documentary, provides a quite different view of the relevant policy networks. The emergency plans include those who are formally responsible for emergency management and a variety of tasks related to evacuee sheltering. For each plan, we identified all of the actors named as responsible parties in the general emergency management network within the core emergency operations plan.

For the Brazos County community, we were able to locate two general emergency operations plans that covered the sample time period. The first plan is from 2004 while the second was approved in 2009. These plans provide a pre-Katrina view and an update following the lessons of the various hurricanes. As in the media reported networks, we have highlighted elements in red that are unique to that plan (that is, not present in the other plan).

4.2.1 2004

Figure 3 presents the network roster from the perspective of the emergency plan.

The emergency operations plans provide a starkly different view of the local emergency management networks. Most obviously, the roster of the network is much shorter than the media reported network rosters. The rosters are focused almost entirely on governmental organizations (with the notable exception of the Red Cross) and the actors are largely persistent across the plans.

4.2.2 2009

The roster looks largely similar in the more recent emergency plans – as represented in Figure 4.

Here again the roster is stable and focused almost exclusively on governmental organizations.

From the perspective of the emergency operations plans, the network includes little variability over time. The actors stay largely the same. A few actors drop out (e.g. Radiological Officer) and a couple of actors emerge (notably, the Salvation Army). A diversity of policy domains are represented

Figure 3: Brazos County 2004 Emergency Operations Plan Membership – unique elements are in red and persistent elements are in bold.

- **County Judge/CM**
- **Asst. County Judge/CM**
- **EMC**
- **Law Enforcement**
- **Fire Services**
- **Public Works**
- **Utilities**
- **Health Services**
- **Human Resources**
- **Community Development**
- **Human Services**
- **Tax Assessors**
- **Transportation/ISD**
- **City/County Attorney**
- **Radiological Officer**
- **Public Information Officer**
- **Parks and Recreation**
- **Treasurer**
- **Justice of the Peace**
- **Red Cross**

Figure 4: Brazos County 2009 Emergency Operations Plan Membership – unique elements are in **red** and persistent elements are in **bold**.

- **County Judge/CM**
- **Asst. County Judge/CM**
- **EMC**
- **Law Enforcement**
- **Fire Services**
- **Public Works**
- **Utilities**
- **Health Services**
- **Human Resources**
- **Community Development**
- **Human Services**
- **Tax Assessors**
- **Transportation/ISD**
- **City/County Attorney**
- **Search and Rescue**
- **Salvation Army**
- **Red Cross**

but the range is not as large or the membership as diverse as in the media reported networks.

5 Caddo-Bossier Parishes, LA Results

The second community in our study is Caddo-Bossier Parishes in Northwest Louisiana. These twin parishes include Shreveport and were a major evacuation site during Hurricane Katrina (and for months afterward). The key is to compare the networks for these two communities.

5.1 Media Reported Networks

Caddo and Bossier Parishes experienced a tremendous influx of evacuees – including tens of thousands of residents for their shelters. These parishes are located far enough away from the coast to miss most of the extreme elements of incoming hurricanes. It is a natural location for intra-state evacuee hosting for Louisiana.

5.1.1 2000-2005

Figure 5 presents the roster of the media reported network for Caddo-Bossier Parishes from 2000-2005.

As in the case of Brazos County, there is tremendous instability in the participants in the media reported network. The persistent components include local fire and law enforcement organizations along with state and federal emergency management organizations. Some nonprofits are persistent while there are many intermittent participants from nonprofit and religious organizations.

As to policy domain representation, we see a similar array in this community as in the last. Transportation and health care organizations are present and persistent. There are other policy areas present (e.g. nutrition support, parks and recreation, and agriculture) but in a more intermittent way.

5.1.2 2006-2009

Figure 6 presents the media reported network for Caddo-Bossier Parishes from 2006-2009.

As in the previous community, there is diversity in terms of policy domain and organization sector. The specific members representing the nonprofit, religious, and private sectors change (with, again, the notable exceptions of the Red Cross and the Salvation Army) but the sectors are present in both periods to a notable extent. Some of the instability is an artifact of name changes through the period (the state shifted to the title “Office for Homeland Security and Emergency Preparedness”). However, representation by local and state emergency preparedness offices seems light compared to what one might expect.

5.2 Plan Based Network

Again we will contrast the media reported network with the official emergency plan for the jurisdiction. In the case of the Caddo-Bossier Parishes, we were not able to collect a historical plan. We only have access to the current plan from 2009. In seeking older versions of the plan, we were assured that the previous versions of the plan operative from 2000 were largely the same as the current plan. When we explained that we were most interested in the actors present and the relationships between actors within the plan, one

Figure 5: Caddo-Bossier Parishes 2000-2005 Media Report Membership – unique elements are in **red** and persistent elements are in **bold**.

- **S Police Dept.**
- **C Sheriff Dept.**
- **National Guard**
- **ARC**
- **DHHS**
- **LA DOT**
- **FEMA**
- **US PH Service**
- **St. Mary Place**
- **S Fire Dept.**
- **NWS**
- **Barksdale AFB**
- **LA HS Athl. Ass.**
- **US DHS**
- **Dept VA**
- **NO Bus. Council**
- **S Human Society**
- **LSU**
- **LA Dis. Rec. Found.**
- **LA Rec. Auth.**
- **Hab. for Human.**
- **S-B Com. Renewal**
- **LA IA Found.**
- **FBI**
- **Fuller Center**
- **S Fabricators**
- **Coca-Cola**
- **LA Oo Tourism**
- **LA Hospital Assoc.**
- **Goodwill**
- **LSU Hospital**
- **ORU**
- **St. Luke's Meth. Ch.**
- **LSU HSC**
- **Unity in Prayer**
- **LA DHH**
- **US Army**
- **Salvation Army**
- **Grace United Meth. Ch.**
- **Natnl. Low Inc. Hous. Coal.**
- **LA Dept. of Ag.**
- **Prof. CLN Assoc.**
- **LA Wild. and Fish.**
- **Brammer Engineering**
- **Boffier Civic Center**
- **LA Dept of PH**
- **Fam. Rec. Corps**
- **US Coast Guard**
- **US Nat. Hurr. Cntr.**
- **US Humane Soc.**
- **VA Hospital**
- **Hibernia Corp.**
- **NPR**
- **Sthn. University**
- **S Expo Hall**
- **Hirsch Mem. Col.**
- **Calcasieu Parish OHSEP**
- **Indep. Stadium**
- **Cham. of Comm.**
- **England AFB**
- **NAACP**
- **US Forest Service**
- **SW Assoc. of Epis. Sch.**
- **LA Do Labor**
- **Food Bank of S**
- **S Charity Hospital**

Figure 6: Caddo-Bossier Parishes 2006-2009 Media Report Membership – unique elements are in **red** and persistent elements are in **bold**.

- **Shreveport Police**
- **FEMA**
- **LA Hight School Athletic Association**
- **LSU**
- **LA Recovery**
- **LSU Health Science Center**
- **LA Tech**
- **LA Association of Business and Industry**
- **LA Dept. of Environmental Quality**
- **LA Public Service Commission**
- **Fuller Center**
- **LA GOHSEP**
- **LA Poison Control Center**
- **Assoc. of Comm. Orgs. for Reform Now**
- **Texas Southern University**
- **Hal Sutton Foundation**
- **LA Education Department**
- **NAACP**
- **LA DHH**
- **LA Nursing Home Association**
- **Caddo Parish Sheriff Department**
- **ARC**
- **LSU**
- **LSU Hospital**
- **Desoto Parish Sheriff Department**
- **United Methodist Committee on Relief**
- **Southwood High School**
- **LA National Guard**
- **LA DOT**
- **Shreveport Fire Department**
- **Salvation Army**
- **Department of Social Services**
- **Sam's Club in Shreveport, LA**
- **LA Animal Response Team**
- **Earl K. Long Medical Center**
- **LA Vet Med. Association**
- **Caddo OHSEP**
- **Hirsch Memorial Coliseum**

representative of the emergency management office said that there would be very few changes. Given the few changes in the Brazos County plans discussed previously, this seems credible (though we are continuing to seek historical plans).

5.2.1 2009

Figure 7 presents the roster for the Caddo-Bossier Parishes emergency plan. In this figure, we have highlighted (in red) the organizations that are present here but have no obvious equivalent in the Brazos County plan rosters.

The roster for this community is larger than the plan-based roster for Brazos County and includes a broader range of organizations. This plan includes a broader range of government actors (including code enforcement and agriculture extension offices). Even with this diversity, though, the diversity of the plan network is still quite limited compared to the media-reported networks.

6 Lessons for Network Dynamics

The lessons for network dynamics depend entirely on which approach to network measurement one prefers. The formal plans provide an image of the networks as limited in scope and stable over time. The small number of participants in these networks tend to stay in the network. The network provides little evidence of permeability to changes – even in what may be seen as a remarkable challenge to the network. These were not networks that operated below the radar of public media attention. Despite the high salience, there is little evidence of change in the participants as viewed through the formal plans.

The media reported networks tell quite a different story. Within these two communities, we see dynamic networks that change size and membership. Each network includes participants from diverse policy domains and sectors. This view suggests participation by the broad civil society in issues of evacuation hosting. Religious organizations provide a broad range of services as well as serving as evacuee hosts. Similarly, private sector organizations are involved in services ranging from providing supplies and meals (sometimes at a remarkable discount). Government organizations from a broad range of policy domain, including – most obviously, public health and transportation;

Figure 7: Caddo-Bossier Parish 2009 Emergency Operations Plan Membership – unique elements are in red and persistent elements are in bold.

- **Caddo-Bossier OHSEP**
- **Law Enforcement**
- **Fire Service**
- **Emergency Medical Services**
- **Hospital and Medical Centers**
- **Caddo and Bossier Health Units**
- **Coroner's Office**
- **Public Works Departments**
- **Water and Sewer Department/Public**
- **Private utility Companies (Natural Gas, Electric, and Telephone)**
- **Parks and Recreation Departments**
- **Caddo and Bossier School Systems**
- **American Red Cross**
- **Salvation Army**
- **Shreveport Airport Authority**
- **SPORTRAN**
- **City and Parish Legal Department**
- **City and Parish Planning Department**
- **Building Inspection/Code Enforcement**
- **City and Parish Finance Department**
- **City and Parish Fleet Services**
- **County Agents, Ag Extension Services, and Soil Conservation Services**
- **Caddo and Bossier Offices of Family Support, Councils on Aging, and Community Action Agencies**
- **Military Units**

but also social services, education, and environmental quality.

This equivocation within the data do not help to resolve the fundamental question related to policy networks. Whether networks are diverse (as issue networks) or limited (as iron triangles) depends to a great extent on the data one uses to view the network. The formal plans provide an image of limited participation that is larger than the most strict iron triangle models, but still limited largely to a steady group of government organizations.

7 Lessons for Network Measurement

The primary lessons from the analysis may be the care that we must take in adopting a strategy for network measurement. The two strategies reported here illustrate the divergence of images possible from two different sampling strategies. Having also conducted interviews within the emergency and shelter management communities, we are confident that both strategies reveal a part of the truth. The formal plans include important actors that sometimes evade media attention but fail to include some other active participants – particularly private and nonprofit actors. The media reports are over-inclusive and equate participation of central and peripheral actors. The truth likely lies somewhere in-between these two images.

One can seek the one best strategy for data collection (including, in addition to the document analysis approaches represented here, situation reports, interviews or surveys). Currently, such a debate is indeterminate. Each focus here clearly has limitations. The formal plans are not representative of diversity and difficult to collect across time. What change there is across time also seems to understate the changes in the network. The media reported networks are the easiest to collect across time but may include participants that we would not want to include as actual network members. Furthermore, there are strong biases in the probability of reporting some organizations within the media accounts. The most reported member of the Brazos County network (by a wide margin) is Texas A&M University. While other methods corroborate their membership in the network (including the community interviews and the formal plans – but only in the plan annexes), there is little reason to believe they are the most central or most active member of the network. Instead, it is likely that they are the most available actor to local and regional journalists. This availability bias may distort any image based on media data. Interviews and surveys are not without their problems as

well. Sampling local officials is likely to involve the formality bias found in the emergency operations plans. Given these various biases, there is no clear contender for best single sampling strategy.

Alternatively, one can pool data from a variety of sources. This is a common practice in emergency management network research as represented by the work of Kapucu and Comfort (Comfort & Kapucu 2006, Kapucu, Augustin & Garayev 2009). The logic behind combining sampling strategies is based on “triangulation” (Jick 1979). When a variety of research strategies (whether data collection or data analysis strategies) contain biases, one may implement different research strategies within the same research project. If different research strategies (with different biases) lead to convergent findings, one can have greater faith in the results than a study that relies on a single method. Contemporary calls for “mixed methods” rely (though not exclusively) on this argument (Nesbit 2011).

The case for mixed methods is not entirely clear, however. If we imagine an analogous situation in survey methodology we might see reason to pause. If one conducted a survey with three different sampling methods (e.g. handouts at the mall, a telephone sample, and an internet sample), it would not be enough to simply combine all of the responses into a single dataset for analysis. One would need to very carefully consider whether some responses should be included at all (one may not want to include handouts at a mall at all given the selection biases present). For all of the methods included, the weighting of the responses would be a difficult question to manage. In most cases, one would either need to control for the sampling method (through complicated dummy variables, possibly) or conduct separate analyses using each sample.

The problem is even more complicated in the sense of network data sets. Sampling for any network level statistics (density, centralization, etc.) depends on the interaction between sampled units. Omitting or incorrectly including a unit has more than a $1/n$ marginal effect. The effect will depend on the interaction with each of the other actors and can increase in n – the size of the network. The plan network is highly centralized with two of the actors (the emergency management office and the county judge/city manager) connected with all other actors. The media networks are much lower density with few actors interacting with more than a dozen other actors (and interactions with more than three are rare). Density measures, though, are highly sensitive to network size and the accuracy of network sampling.

Combining the datasets creates another complex problem. There is no

obvious way to weight the inclusion of network units. Given the interdependence of network units, it is not as simple as the standard tools for weighting units within complex survey samples. If we combined these community network measures, the media network units would overwhelm the plan based members. The resulting network level statistics would be driven by the media network and very little signal from the plan-based networks would make it through. This makes us quite hesitant to simply pool the units and the relations.

We do not propose a solution to the problem here. At the very least, the result suggest how important it is to consider network studies from multiple measurement strategies. It also draws into question simple pooling of results from disparate measures without careful consideration of the proportion each method contributes to the pool, the distinctiveness of each methods contributed units, and the potential confounding biases included in each method.

8 Conclusion

Network analysis is an emerging and potentially powerful toolset for the study of policy implementation generally and emergency management networks specifically. The results of studies of two emergency and shelter management networks here provide some insight into the dynamics of these networks over time – but raise substantial questions about the nature of data collection for network analysis.

Two different methods of data collection provide starkly different portraits of the emergency and shelter management networks. The media reported networks provide a vision of a broad issue network including an ever-changing roster representative of various policy domains and organizational sectors. The plan-based networks are much smaller and focus almost exclusively on government partners and a handful of longstanding nonprofit partners. Which of these images is correct? The answer is not entirely clear from data themselves or from corroborating interviews within each community. Of course the interviews have their own set of biases.

The strongest conclusion from the study is the need to think much more carefully about the nature of administrative network data. Single source networks are prone to a variety of biases ranging from availability bias to organizational and formal biases toward specific sectors. Multi-method stud-

ies, however, are also difficulty in the absence of clear rules for pooling data into coherent aggregate networks.

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