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Social Science Research

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Evacuation Models and Dynamics

Louisiana State University

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Mississippi State University

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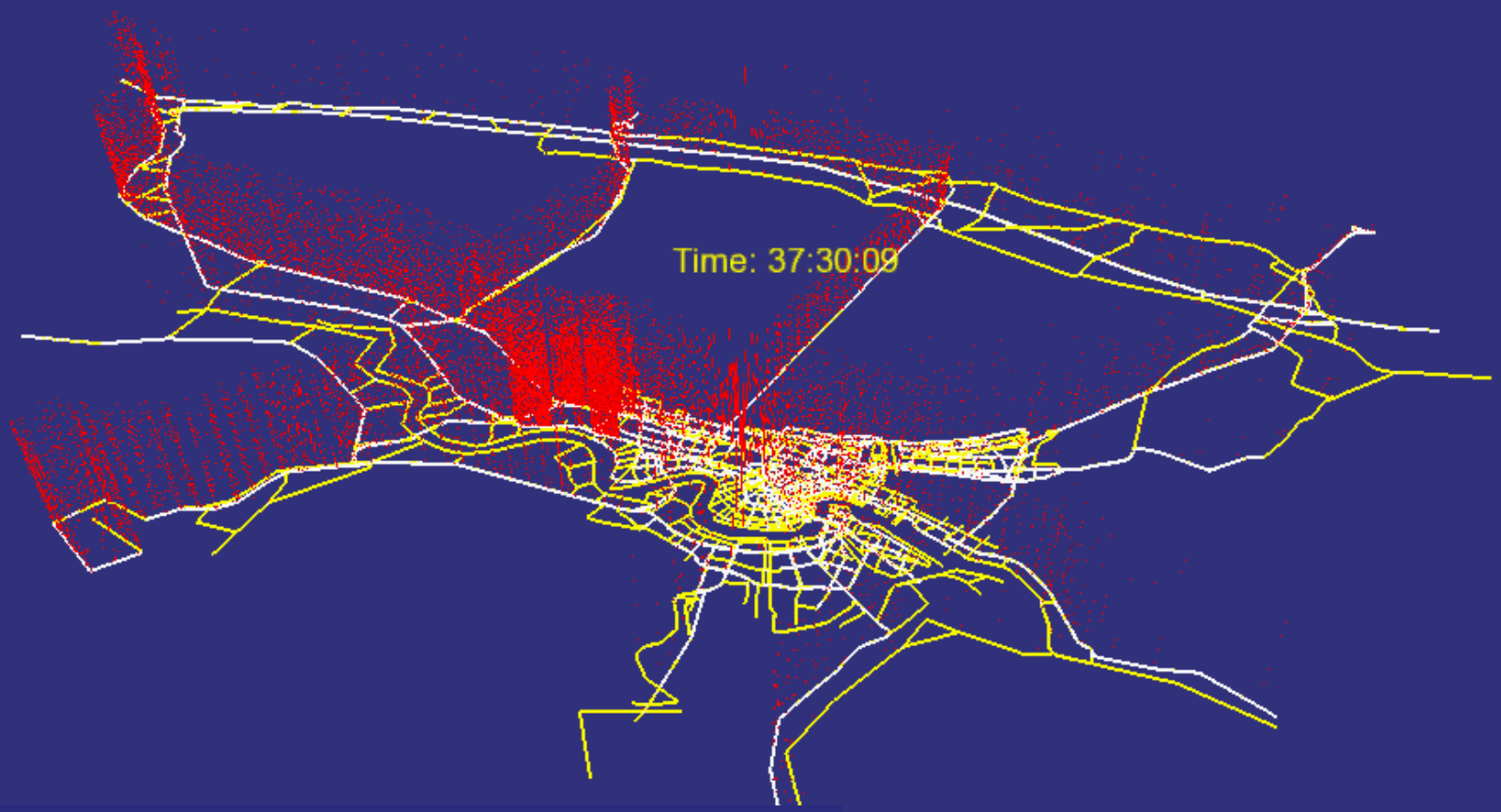
Texas Southern University

Carol Lewis

Evacuation Models and Dynamics –

- Develop transportation simulation models to more effectively plan regional transportation infrastructure improvements for disaster scenarios
- Test and evaluate evacuation scenarios under a variety of potential conditions
- Integrate geographic information systems, transportation policy, evacuation travel demand forecasting, and operational-level multimodal traffic modeling on a regional basis
- Leverage ongoing projects, including the TRANSIMS regional multimodal evacuation model and the GIS mapping systems

Regional Multimodal Microscale Evacuation Modeling & Simulation



New Orleans Katrina evacuation model tracking over 500,000 individual vehicles, over an area of more 4,000 square miles, over a period of 48 hours.

Evacuation Models and Dynamics - Approach

- The research will initially focus on New Orleans, then Houston, with a ultimate goal of generalizing it to other locations and types of hazards
- The findings will inform the temporal declaration of evacuation orders and the implementation of pro-active evacuation measures such as phased evacuations and contraflow
- Seek to improve the integration of disaster management needs into the two, six, and 25 year transportation system planning processes

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Optimizing Knowledge Networks in Disaster Response

Louisiana State University
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Optimizing Knowledge Networks in Disaster Response - *Objectives & Approach*

Objectives	Ad Hoc Network Approach
• Identify obstacles to interorganizational communication and coordination • Investigate the usefulness of knowledge networks across phases of disaster response • Develop actionable strategies to improve effectiveness	• *Characteristics*: changing set of participating organizations; different goals and roles; diffusion of knowledge across the network; formal informal communication channels • *Network dynamics*: evolving network structure and membership; changing task requirements, resources, knowledge requirements and capabilities

Optimizing Knowledge Networks in Disaster Response - *Research Strategy*

Study 1 **Interviews and Delphi Study**	**Study 2** **Facilitated sessions with 10-15 senior incident commanders**
• Purpose: Identify key issues and challenges • Expert Panels: 1) responders with experience in leadership roles, and 2) academic researchers with experience in disaster response and communication/coordination networks topics	• Purpose: Review/elaborate the findings of the Delphi study; identify actionable strategies; suggest approaches to responder training • Methodology: cognitive mapping technique

Develop/pilot training materials; disseminate results to responder and academic communities.

Optimizing Knowledge Networks in Disaster Response - *Potential Collaborations*

- Possible opportunities to integrate study findings with the results of other research initiatives investigating topics affecting communication/coordination during disaster response (e.g., research on the use of information & communication technologies)

- Some findings of this research may also be applicable to communication/coordination in specialized ‘sub-networks’ involved in short- and long-term disaster response efforts (e.g., community of health-care providers, providers of social services)

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Computational Network Modeling

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Dek Terrell

Objectives

- Design and model complex emergency response networks.
- Identify critical relationships and key vulnerabilities.
- Understand how individual incentives and assessments of risk affect actions and outcomes in the wake of a major disaster.

Methodology

- Identify actors and relationships, nodes in the network.
- Model the actions of various nodes in the wake of a major disaster.
- Simulate behavior of players in a major disaster and compare to previous disasters, estimate behavioral parameters, compare to data.

Research Plans

- Build theoretical models using information obtained from background work.
- Using insights from theoretical model build more complex simulation models.
- Sensitivity to node loss, different incentives and structure of organization.
- Practical applications with data

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Supply Chain Structure and Management

Louisiana State University
Peter Kelle
Helmut Schneider

Supply Chain Structure and Management

Supply Chain Management (SCM) models

- applied successfully by private companies will be *extended and modified*
- considering the results of disaster supply cases.

Methodology

- Interviews (Wal-Mart, FEMA, Charities)
- Case studies, survey
- Quantitative modeling
  - Resource focus
  - Distribution focus
  - Supply chain integration
- Scenario construction and simulation
- Evaluation, feedback, modifications

Collaboration topics

- Capacity reservation, pre-arranged contracts
- Multiple sourcing, flexible contracts
- Robust supply models
- Robust supply network planning, redundancy
- Robust supply chain, risk management, resilience
- Knowledge Network

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Citizens and Preparedness: Risk Perceptions and Revealed Preferences

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Catherine Eckel *UT-Dallas*

Rick Wilson *Rice University*

Research Objectives

- Understand the perception of risk, risk preferences, and preparedness priorities of citizens and public decision-makers.
- Understand how the risk perceptions of individuals and government decision-makers affect their preparedness and behavior.
- Compare perceptions of risk and concomitant behavior across different segments of society (demographics, geographic locations, role).
- Identify policy design flaws and implementation barriers that arise from differences between citizens and policy makers in terms of risk perception, risk pooling, and future orientation.
- Propose improved policy designs that enhance preparedness based on a better understanding of how people perceive and react to risk.

Research Questions

- What are the risk preferences of individual decision-makers vs. governmental decision makers?
- Do individuals and government decision makers use risk information the same way?
- How are decisions about compliance linked to risk preferences?
- How much are individuals willing to pay to mitigate risk?
- How much do individuals need to be compensated to accept risk?
- Do policy makers adequately forecast the risk attitudes of the citizens affected by disasters and disaster-related policies?
- Do different social groups (wealthy/poor, families, ethnicities) have different mechanisms for pooling risk?
- Is there a difference in time preferences (discounting or planning for the future) for residents in high risk areas versus low risk areas?

Design and Progress

Design:

Experiments linked to national surveys

- Participants in the experiments will be asked to complete a survey with some or all of the same questions asked of the national sample
- The national survey will include questions analogous to the experiments

➢ *The experiments and survey inform each other to permit causal claims to be made and generalized*

Progress:

- Researchers have met to collaborate on conceptualization and design
- Literature review and existing survey instrument “mining”
- Preliminary survey questions
- Preliminary experiment designs
- Field sites for experiments chosen

Timeline and Collaboration

Timeline (Year One):

- Experiment field site visits in March
- Pilot test experiments and revise protocols in April/May
- Develop survey instruments in April/May
- Pilot test and revise survey instruments in May/June
- Experiments conducted in July
- National citizen survey conducted in July

Collaboration:

- Unique opportunity to pair survey work and economic experiments – current collaboration a model for both project teams for future research
- START COE terrorism preparedness research has natural links which will be explored
- Study findings will inform future research on citizen and decision-maker disaster preparedness communication and education; collaboration possible with education partners

Children's Resiliency Post-Disaster: Risk and Protective Factors

Louisiana State University
Mary Lou Kelley
Medical University of South Carolina
Ken Ruggiero & Connie Best

Research Goals: Phase 1

1. Continue evaluating children's adjustment post Katrina at yearly intervals for three years with emphasis on resiliency.

2. 2. To obtain longitudinal data from a new disaster exposed sample focusing in children's resiliency.

Research Goals: Phase 1

3. Conduct focus groups with disaster survivors to identify additional factors potentially related to resiliency in children and families

4. Develop psychometrically sound measures of child coping, social support, and post traumatic growth