

Changing Perspectives in the Analysis of Natural Disaster Data

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Classical vs. post-'911' disaster risk analysis

- Most probable vs. worst-case scenario
- Hazard vs. vulnerability, exposure, elements
- Hazard profiles: magnitude, duration, seasonality, speed of onset, frequency
- Elements include property, infrastructure, people
- Vulnerability: susceptibility of elements to damage or injury

Classical vs. post-'911' disaster risk analysis

- Capacity: elements ability to resist a hazard's harmful effects and/or recover easily
 - factors that increase/decrease an element's capacity
- Risk= hazard + vulnerability + capacity
- Single hazard vs. multi-hazard approach

Challenges

- Location not chosen beforehand
- Spatial distribution of population different pre and post disaster
- Research design must be done quickly without having all knowledge of the situation

Operational Considerations

Preparation of research personnel for disaster field setting

- Health and Safety
- Incident Command System
- Self-sufficiency

Preparation of research personnel for data collected at partner institutions

Importance of COOP/BCP planning

- Care for local researchers and back-up systems
- Mutual aid agreements between nearby universities and emergency management agencies and organizations
- CISD for academic/research institutions

Operational Considerations

- GIS-oriented software packages
- CAMEO (Computer Aided Management of Emergency Operations) package (EPA)
- HAZUS-MH (FEMA)
- Interoperability with SAS, SPSS and other commonly used statistical analysis software

NSF Katrina Study

Background

Hurricane Katrina

- Third strongest land falling U.S. hurricane recorded
- Second Katrina landfall hit Southeast Louisiana as a Category 3 hurricane
- 81.2 billion US dollars in damages
- 1580 confirmed deaths in Louisiana (direct and indirect)
- Hundreds of Louisiana residents still classified as missing

NSF Katrina Background

Pre-Katrina U.S. Census Bureau data

- Louisiana (2000) 4,468,976 White-64.1% Black-33.0% (2004)
- Orleans Parish (2000) 484,674 White-28.6% Black-67.8% (2004)

Post-Katrina Rapid Population Estimate Project data (City of New Orleans)

- Orleans Parish (January 2006) 181,400
- Estimated that N.O. West Bank and unflooded area populations decreased only 2,000 to 5,000 each, but that flooded Orleans areas had a population decrease of 296,000.

Purpose/Aims

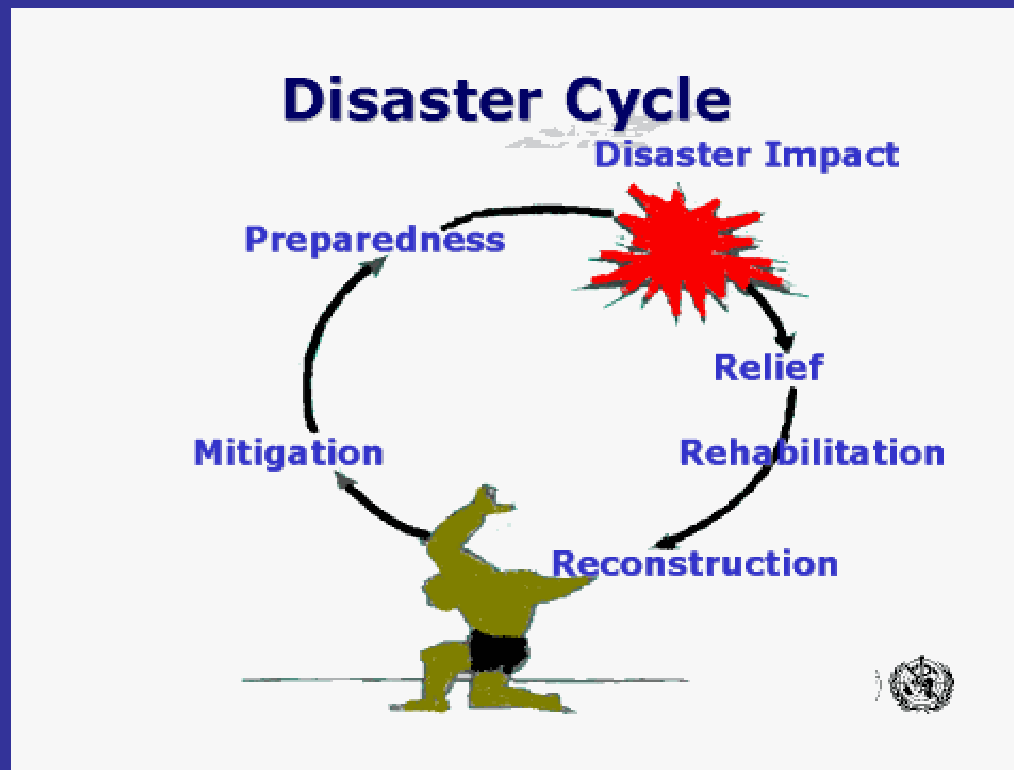
- Hurricane evacuation modeling
- Latent trait analysis
- Quantify impacted population reaction to hurricane response
- Social network analysis

Data Collected

- Demographic
 - Spatial
 - Expectations and preparations
 - Past experience
 - Chronology
 - Post-event reaction to response
- Suggested improvements
- Phased approach

Definitions Used

- Disaster cycle definitions as outlined in FEMA's course, "Principles of Emergency Management"



Definitions Used

Other definitions/jargon used in post-disaster analysis settings from international health, sociology and international development field.

Sampling Strategy

Overall sample size goal was 500

Method 1: Face-to-face interviews in the New Orleans area conducted by project staff.

Map of generally flooded and non-flooded areas, as well as housing density.

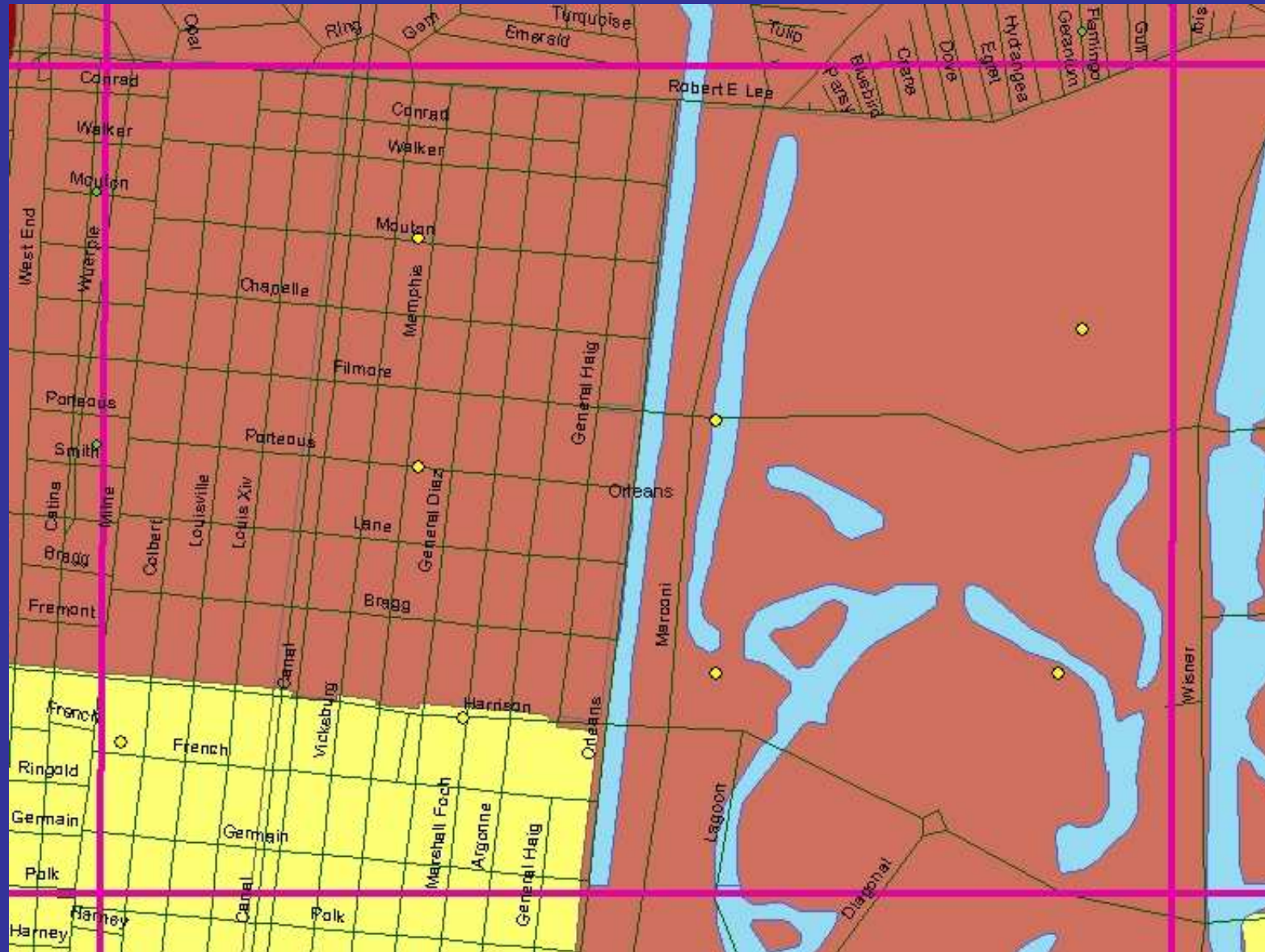
Crude estimate of flooded area---75%

Overlay grid for Orleans parish

Sampling strategy (continued)

- Grid square size: Manageable size for 1 person or 2 person team/day
- Want to randomly pick 380 points in flooded areas & 120 in non-flooded areas.
- Areas with higher housing density get more points

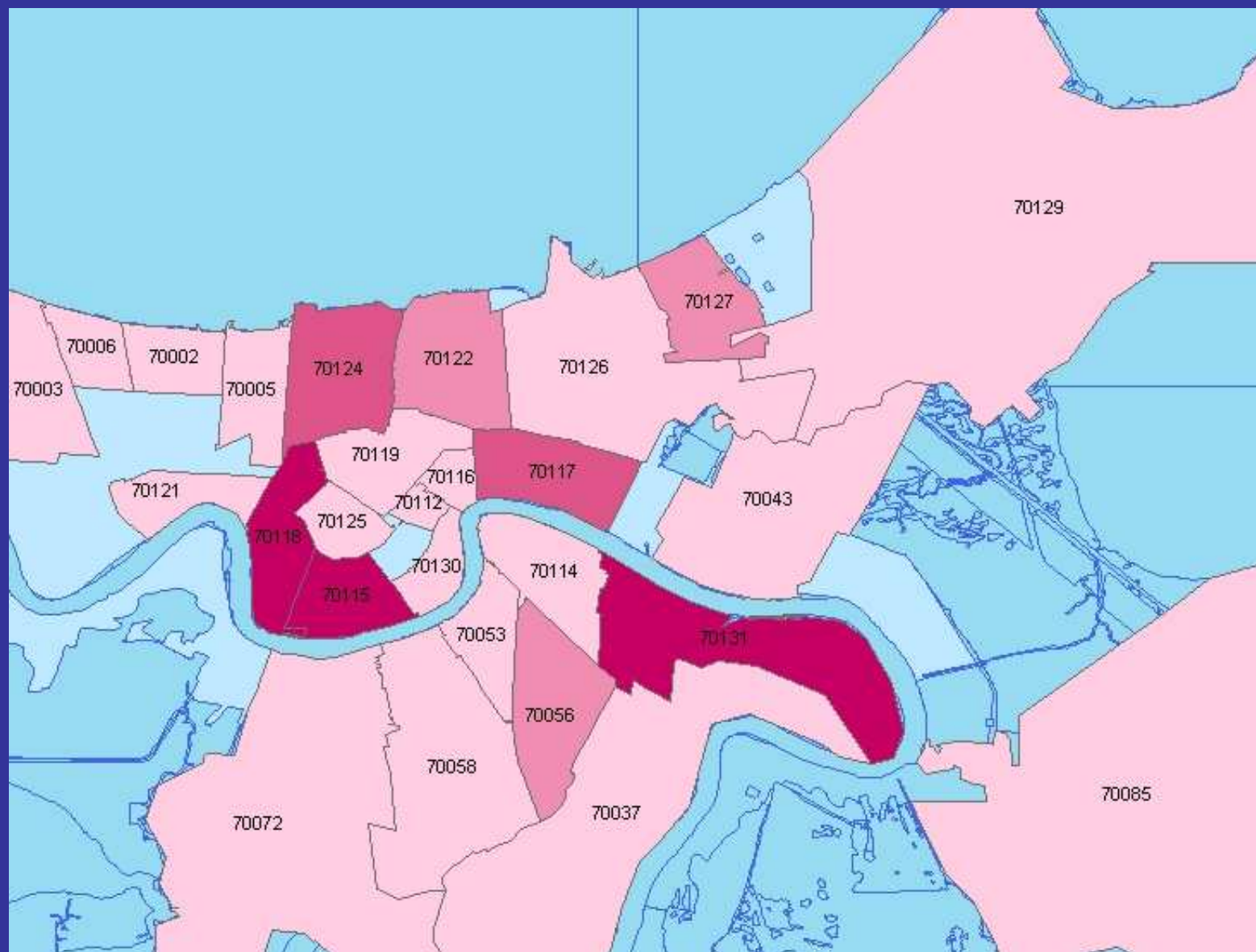
Street Map of Grid Square B5



Sampling Strategy (continued)

- Methods 2 & 3
 - used random digit dialing of 504 area code landline or cellular telephone numbers
 - CATI (Computer Assisted Telephone Interviews) system
 - offsite

Interview concentration by zipcode-UNCC landline interviews



Interview concentration by zipcode-UNCC cellular interviews



Sampling Strategy (Continued)

Pros

Increased interview coverage in severely devastated post-disaster setting

Increased safety of project staff

Cons

Not accepted by many telephone survey organizations or groups yet

Respondent compensation for cellular airtime usage

Study Population

Gender

42% male

58% female

Race

African-American 39%

Caucasian 56%

Other 5%

Living arrangement

Own 75%

Rent 19% Other 6%

Income

<\$20k 20%

≥\$80k 25%

Evacuation

- 81% evacuated, 19% stayed
- Of 53 subjects that stayed, only 26 were rescued; may be of interest to see differences between those requiring rescue and those rescuing themselves.
- Whites 2.44 times more likely to evacuate than African-Americans

Evacuation & Income

Income N=240	Frequency (Row Percentage)	
	Evacuated	Stayed
<\$20,000	38 (78)	11 (22)
\$20,000-39,999	48 (80)	12 (20)
\$40,000-79,999	62 (87)	9 (13)
≥\$80,000	49 (82)	11 (18)

Note: There are 47 missing values, of which 43 are refusals to answer this question

Evacuation & Race

Race N=286	Frequency (Row Percentage)	
	Evacuated	Stayed
African-American	82 (73)	30 (27)
Caucasian	140 (87)	21 (13)
Other	11 (85)	2 (15)

Evacuation & Number of Moves

(In person interviews only), n=109

Number of moves	Frequency (Row Percentage)	
	Evacuated	Stayed
2-3	25 (93)	2 (7)
4	15 (75)	5 (25)
5	23 (72)	9 (28)
6-11	17 (57)	13 (43)

χ^2 and trend tests significant with p-values <.05

Those that stayed moved more than those that evacuated

Income & Number of Moves

(In person interviews only), n=102

Number of Moves				
	2-3	4	5	6-11
Income				
<\$20,000	6 (30)	2 (10)	5 (25)	7 (35)
\$20,000- \$39,999	4 (14)	4 (14)	13 (45)	8 (28)
\$40,000- \$79,999	7 (24)	7 (24)	7 (24)	8 (28)
\$≥\$80,000	9 (38)	4 (17)	6 (25)	5 (21)

Race & Number of Moves

(In person interviews only), n=109

Number of Moves				
	2-3	4	5	6-11
Race				
African-American	15 (22)	14 (21)	22 (33)	16 (24)
Caucasian	11 (31)	5 (14)	8 (22)	12 (33)
Other	1 (17)	1 (17)	2 (33)	2 (33)

Influencing evacuation factors, n=111

Evacuated

1. Other family members (28)
2. Personal decision (14)
3. Hurricane size, strength and/or direction (13)

Stayed

1. Past experience with hurricanes (7)
2. Employment, work or job (5)
3. Illness or injury of household occupant (4)
4. Personal decision (4)

Upcoming Statistical Analyses

- Incorporate spatial variables into analysis
- Latent trait analysis
- Analysis of spatio-temporal chronologies

Any questions?