Collaborative Research: DRU: Reconstituting Community: Social and Geographic Elements of Disaster Recovery. Community Recovery in Greater New Orleans since Hurricane Katrina.

PROJECT DESCRIPTION

RESULTS OF PRIOR NSF-SUPPORTED RESEARCH

Frederick Weil's research (NSF 0554572: "The Social Fabric Under Stress. Baton Rouge's Explosive Growth after Hurricane Katrina") produced findings about Baton Rouge's reception of hurricane evacuees, from housing and helping them, to attitudes toward FEMA trailer parks, and how people handled stress during and after this period. Weil has published two articles, and has one in draft and two in preparation, all for refereed journals; five papers presented and three accepted for professional conferences; plus a website describing the research and findings. Troy Blanchard (NSF 0617538-Collaborative Research on Inter-firm Job Mobility, Local Labor Markets, and Organizational Dynamics: Insights from a New U.S. Longitudinal Employer-Employee Data Resource) began on September 1, 2006 and expires on August 31, 2009. This is still an active proposal. Dr. Blanchard has performed a literature review for project publications and submitted an application to the U.S. Census Bureau to gain access to the Longitudinal Employer Household Data. Dr. Blanchard anticipates approval by the U.S. Census Bureau in Fall 2007. Andrew Curtis and Jackie Mill's research (NSF: 0807462 SGER: Spatial Patterns Of Post-Wildfire Neighborhood Recovery began on 02/01/08 to study the recovery of neighborhoods after the California wildfires of 2007. One data collection trip has been completed to Long Beach, all student personal have been employed and trained, and a website is under construction for data dissemination.

RESEARCH OBJECTIVES

This research aims to assess the contribution of social capital and social organizations – community – to Greater New Orleans' recovery from Hurricane Katrina, from a social and geographic perspective. We attempt to look beyond basic population, damage, and economic numbers and find out what people's intentions are to stay or leave, their reasons, what they have gone through, how they feel about it emotionally and spiritually, whom they praise or blame – and to relate these subjective factors with the process of physical recovery. We also investigate what community strategies and actions have been most effective in promoting recovery. The proposed research is part of a larger research project, and while the proposed research stands autonomously, we indicate how it fits into the larger research program.

At present writing, two and a half years after the event, assessments of the pace of recovery remain mixed: "With unemployment at a three-year low, New Orleans continues to make economic strides. However, the first notable slowdown in population recovery in nearly two years threatens these gains, particularly due to a dearth of skilled workers for recovery-related jobs [which in turn, depends on the growth of adequate] housing, infrastructure, and quality public services" (Brookings and GNOCDC 2008). Moreover, "many residents along the Gulf Coast wonder what has happened to the large amounts of money sent by the federal government to help rebuild our area. They also wonder about the large amounts sent by charities. They aren't seeing this money at work in their neighborhoods" (Ahlers, Plyer, and Weil 2008). Yet it is striking that New Orleans residents – despite their negative assessments of government at all levels, and their frustration at the slow pace of recovery – express warm feelings about their own community leaders (Schwartz 2006). Indeed, observers since the beginning have stressed the importance of private, nonprofit, and community efforts – especially those of faith-based and neighborhood organizations – and the ineffectiveness of government actions and managerial approaches (LANO 2006). The present research focuses on these "bottom-up" efforts.

Importance of Community Factors. We posit that the recovery from the disaster rests on three legs: (1) the degree of physical destruction (negatively), (2) the material and economic resources that people can bring to reconstruction, and (3) the contributions of social networks, community organizations, and leaders. Our research proposes to examine the contribution of these community factors to the recovery. We focus especially on the importance of networks of social support, nonprofit and community organizations, and the geographic frame of neighborhood patterns and linkages – all from a multi-level social and geospatial perspective – net of physical destruction and material resources. By approaching the question in this fashion, we also hope to isolate the importance of specific actions and strategies, and thereby identify a number of best practices that social actors can adopt.

Theoretical Perspective. Much research on disasters and disaster recovery is done from an expert, policy, and planning perspective. However, observers recognize that there have been many delays

and shortcomings in government and expert response, and that the rates of recovery vary widely among different communities (Brinkley 2006; Horne 2006). Indeed, top-down perspectives acknowledge that intangible factors like social "resilience" play a major role, but they often find them difficult to explain.

Yet concepts like social resilience have a long history in social theory. Much current work on "social capital" stresses the importance of social networks, reciprocity, and interpersonal trust, which allow individuals and groups to accomplish greater things than they could by their isolated efforts (Coleman 1990; Putnam 2000, 2002, 2003; Lin et al 2001; Paxton 1999; Sampson et al. 2005; McPherson et al. 2006). Likewise, "critical mass" theory tries to account for the importance of threshold levels (or tipping points) of organization or participation, often among members with unequal resources, in generating collective goods (Marwell and Oliver 1993). Earlier, related, work on democracy and political participation stress the importance of community, religion, family, social organizations – namely, civil society – in promoting the self-restraint that makes democratic government and a free-market economy possible (Verba and Nie 1972; Verba et al. 1995; Lipset 1981; Greeley 1997; Norris 1999; Putnam 1993, 2002; Skocpol and Fiorina 1999; Skocpol et al. 2000; Weil 1989, 1993, 1994a,b, 2000). These ideas can be traced back to the Federalist Papers, Adam Smith, John Locke, and earlier (Weil 1987). They probably come together most fully in the first empirical and theoretical accounts of modern democratic society by Alexis de Tocqueville (2000, 2001) (and to an extent, John Stuart Mill [1973]).

Tocqueville's account of democratic society centers on the concept of liberty, defined as local self-governance, in contrast to despotism, defined as centralized administration. In this view, free citizens who act together in community – using institutions of civil society like churches, voluntary associations, the press, and so on – are able to take immediate action to address issues that face them. They do not wait for a higher authority to solve problems for them, but rather, join together in addressing them themselves. In contrast, subjects of despotic government are like children clamoring for hand-outs from the authorities, and squabbling with each other. Each person regards only his or her own self-interest and is jealous of what anyone else gets. As a result, they are incapable of cooperating or acting for themselves and must wait for government to help them. While few observers believe that the contrasts are as stark as Tocqueville paints them, or that a central authority is ever entirely absent or unnecessary, most modern theories of community or collective action accept the basic outlines of this account. In the present proposal, we also build on these concepts to try to account for why some communities have apparently made more progress in their recovery than others, net of physical damage, economic resources, and government assistance. We think this perspective can help us understand what community *strategies* have been most effective, and what we can learn from them in a general sense.

RESEARCH DESIGN AND METHODS

Our research design contains two main elements which are meant to be straightforward but comprehensive for addressing our questions. *First,* we conduct social surveys of a wide variety of populations and communities, which focus especially on embeddedness in various communities and social networks. The surveys include measures of respondents' experiences, plans, and perceptions, their well-being, stress, and religious sentiments, as well as their social network and organizational connections. *Second,* we make our own independent, direct assessments of storm damage and recovery, both to survey respondents' dwellings, and to selected entire neighborhoods in which they live. We bring our two research elements together in a GIS (Geographical Information System), which will be used to reveal both spatial patterns and processes between the variables. We expect to find spatial variation in recovery, and for different scales (for example street segments and city blocks) within the same general neighborhood. Finally, in related research (*not* included in this proposal), we do surveys of organizations that represent respondents' communities – especially faith-based, neighborhood associations, service organizations, local schools– and attempt to link best practices with measured outcomes. (This is a multilevel analytical design.) At all steps of the data collection and analysis, we attempt to put as much usable information as possible into the hands of community leaders, who are in a position to actually help their community members and clients. A Diagram of our Research Design is shown in **Figure 1**. Additional information about the larger project is available at http://www.lsu.edu/fweil/KatrinaResearch.

SOCIAL SURVEYS

The Survey Instrument. Our survey assesses the state of recovery of individual residents, and attempts to locate them in their social networks, organizational, and neighborhood environments. The

survey contains several "hooks," or merge variables to link individuals concretely to these geographical and higher-level variables, so that we can build geospatial and multi-level models.

The survey focuses on a range of objective activities and subjective feelings and views of respondents. These issues include: How much damage did residents sustain? What will it take to recover? Do people consider it worth it? Are they willing? Where did people go if and when they evacuated? Did their own community care for them? Who is staying, who is leaving, and why? Is it jobs? Family connections? Destruction and loss? Is it the strength and vibrancy of members' own community? The general community? Do residents feel safe and protected from future storms? What can leadership do to help people return and rebuild? How much did community members work together, cooperatively, during the aftermath and the recovery? How much cohesion is there within each community? To what degree do the actions of an immediate neighbor influence their own? What have the disasters meant to members spiritually? How much stress is there among residents, and what can help mitigate it? Do community members feel supported by their communities outside Greater New Orleans? Whom do residents praise and blame? How do residents differ on these questions among themselves – within families, between people who differ in their religiosity, their education, their economic standing, between age and gender groups, and so on.

The survey instrument draws on previous research on social capital, social networks, community and social support, nonprofit and faith-based organizations, and a variety of other fields. The questionnaire is available online at http://www.lsu.edu/katrinasurvey/lsukatrinasurvey-nolageneral.pdf. In particular, we use social capital indicators developed by Robert Putnam in his 2000 "Social Capital Community Benchmark Surveys" (Saguaro 2000). This was a multi-community survey, and Weil directed the Baton Rouge portion, with Blanchard's collaboration, and has replicated the indexes in numerous subsequent Baton Rouge surveys (LSU Sociology 2007). We also replicate several questions used in national surveys in the aftermath of Hurricane Katrina, and replicated by Weil, Shihadeh, and Lee in their NSF-supported post-Katrina Baton Rouge surveys (Weil 2006, 2007; Weil, Shihadeh, and Lee 2005, 2006; Lee, Weil, and Shihadeh forthcoming). However, most of the survey instrument was developed by Weil on the basis of months of in-depth, unstructured interviews with community leaders, community members, evacuees, and clients of relief organizations, from a variety of communities and organizations.

Sampling Challenges. Normal telephone and face-to-face surveys remain extremely difficult to conduct in Greater New Orleans since the hurricane (Airriess 2006; American Red Cross 2005; Banks 2006a,b; Collective Strength 2006; Henderson 2006; Howell et al. 2006a,b,c; Herrmann et al. 2006; Kessler 2006a,b; Morin 2005; Patel and Vogenbeck 2006; Prevention Research Center 2006; Texas HHS 2006; Washington Post 2005; Schafer and Singelmann 2007). On the basis of continuing experience in Greater New Orleans since the storm, the LSU Public Policy Research Lab (PPRL: the survey lab) estimates that, *even after* disconnected telephone numbers are purged from a random list, only 52 percent of the numbers are valid, working numbers. This makes ordinary surveys extremely difficult. If it were not so difficult, there would be a flood of high-quality samples – because there is intense interest in the recovery – but there are not.

Given these difficulties, we are pursuing a multi-method approach to sampling and data collection. This includes random digit dialing (RDD) telephone interviewing, door-to-door interviewing, sampling through membership organizations, including faith-based, sampling through service providers, interviewing at community events, sampling through notices, including on-line notices, and partnering with government and nonprofit agencies. **Table 1** gives examples of some of this sampling, and we describe some of the examples in more detail below.

We have already collected about 2,300 interviews – from June, 2006 to the time of this writing (February, 2008) – with essentially no funding to this point. The sample at this stage is not yet fully representative, but it already gives broad coverage of most population segments. **Figures 2 and 3** indicate the initial sample composition and geographical coverage.

We have received a small amount of seed funding from LSU,[1] which we will apply to rounding out this sample, socially and geographically. In addition, the NSF Sociology Program has recommended funding for Weil and Blanchard's proposal to complete this first sample wave and to conduct a second

[1] Co-PIs are John Pine, Professor of Geography and Director of LSU's Department of Disaster Science and Management, Barrett Kennedy, Associate Dean of the College of Design and Director of CADGIS Lab, and Daphne Cain and Juan Barthelemy, Professors in the LSU School of Social Work. Pine and Kennedy lead the GIS component, and Cain and Barthelemy lead the survey of organizations.

wave a year later.[2] Weil and Fagan, in partnership with Providence Community Housing, also have a proposal pending with the Greater New Orleans Foundation, to do a smaller (in one neighborhood), pilot version of much of the work described in the present proposal. *We seek funding in this proposal to collect a third social survey wave to measure change over time (or a second wave if our pending proposals are declined), and to merge and analyze the survey data jointly with independently-measured damage/recovery assessments, as described below.*

Sample Design, Representativeness, Weighting, and Confidentiality. We seek a sample adequate to capture the variance in the population on our variables of interest. Ideally, we would like to include people who have, and who have not, returned; we would like people who are closely embedded in social networks and organizations, and those who are relatively isolated socially and geographically; and we would like people in communities with effective leadership, following effective recovery strategies, and those in less successful communities. Such a sample would enable us to investigate the importance of community on the relative success of rebuilding.

However, as indicated, it is very difficult to draw such a sample in Greater New Orleans at present. It would be hard to sample stayers and leavers under the best of circumstances, but it is much more difficult under present circumstances. Our strategy is to make a virtue of necessity, and consists of four parts: (a) standard RDD telephone interviews and face-to-face interviews in representative geographic areas and communities; (b) interviews with church-, organization-, and neighborhood members, in cooperation with their leaders; (c) interviews with people who have evacuated and not yet returned, who will be located by several means; and (d) snowball sampling, with relatives, friends, and neighbors of respondents, especially those who have not returned and are otherwise difficult to locate.

Because sampling is so difficult, we will weight the sample to improve its representativeness. (Indeed, many current multi-stage sampling methods also include weighting: our quasi-quota approach may not suffer greatly by comparison, but may differ mainly by degree.) In order to develop a weighting profile of the Pre-Katrina population in the New Orleans region, we will draw on Public Use Microdata Sample (PUMS) from the 2003 to 2006 American Community Survey (ACS). Using these data we will construct age by sex by race/ethnicity tabulations of the Pre-Katrina population to be used for weighting. We will also explore the use of additional socioeconomic variables to develop a more detailed weighting matrix. To accomplish this, we will examine PUMS data from Census 2000 to create a crosstabulation of the adult population by age, race/ethnicity, sex, homeownership (owner, renter), and household income. We may also be able to pool Census 2000 PUMS with 2000-2006 ACS microdata to obtain appropriate cell sizes for our weighting crosstabulations.

Repeated cross-sectional samples are difficult enough; a full panel sample design hardly seems feasible. Yet, we may be able to re-interview some respondents: A quarter to a third of our respondents (ca. 500-600 people so far) have given us contact information and permission to contact them again. Thus, some panel analysis may be possible, though we will only depend on repeated cross sections.

Confidentiality is a critical component of this study. We have developed an innovative method to re-identify respondents, without violating confidentiality. Besides asking respondents for (re-) contact information, we ask them for the first three letters of their mother's *first* name and the day of the month of their birthday, their pre-Katrina street address, and the common questions of birth year and gender. Most respondents provide this information, and it will allow us to identify re-interviewed respondents in most cases. We will remove information from the records that would allow confidentiality to be revealed, once we have prepared the data set. Because street location is used to link to the GIS analysis described below, spatial confidentiality is also a concern. The authors of this proposal are well versed in this issue, and have considerable experience working with private (health related) data in a GIS environment (Curtis, Mills, and Leitner 2006; Leitner and Curtis 2004; Leitner and Curtis. 2006). No maps will be produced for public consumption that will allow for a third party to identify an exact or even proximate residence.

Examples of Sampling, completed and projected. Because our sampling has been so varied, and because we project that sampling will continue to be varied, we give some examples of data collection completed and projected (see **Table 1**).

The Jewish Federation of Greater New Orleans (JFGNO). The JFGNO sent an email to all its members with email addresses (N=ca. 1,800) with a link to an online version of the survey, and notices were given at area synagogues and Jewish Community Centers, and at various gatherings. 713 community members completed the survey during the second half of 2006, mostly online, and 20-25

[2] At present writing, this proposal is pending final approval at higher levels of NSF.

percent of respondents had moved away from New Orleans and did not plan to return. Weil completed a second survey of the community in 2007, by telephone and internet (N=799), partly on different matters, but partly with questions repeated from the 2006 survey.

The Catholic Archdiocese of New Orleans. Parish churches partnered with us at varying levels. For instance, St. Dominic's in Lakeview and Our Lady of Prompt Succor in Chalmette (St. Bernard), two of the hardest-hit areas, allowed us to address their parishioners, distribute surveys after mass, and published encouragement in their bulletins and websites. The Archdiocese also included a notice in its weekly communication with its parish churches, encouraging them to participate in the survey. Altogether, our combined efforts yielded over 600 responses.

The Broadmoor Improvement Association (BIA). The Broadmoor community, in the center of the city, was badly flooded, and is of great importance because (a) it closely reflects the entire city in its economic and race/ethnic diversity, and (b) its leadership and membership are so active, well-organized, and effective. Its rate of recovery is quite high, considering levels of damage and residents' resources. We have worked closely with the BIA, which has allowed us to address their community meetings and has sent residents emails, posted a notice on their website, and distributed paper copies of the survey door-to-door to every residence in the neighborhood. These efforts have produced over 300 responses so far.

The Vietnamese Community. We have engaged in close discussions since April 2006 with Fr. Nguyen The Vien and other leaders of the Vietnamese community of New Orleans East. This community is very well organized and quickly recovered from storm damage, and has resumed its future-oriented planning and development. Fr. Vien has been enthusiastic about doing the survey, and we have had it translated into Vietnamese. Interviewing is currently being done under the direction of community leadership.

Other neighborhood associations. We have worked with several dozen groups. For example, we completed about 150 door-to-door interviews and did damage assessments of all 2,000 homes in partnership with the Pontilly Neighborhood Association and 40 law school student volunteers, in this middle to upper-middle income African American community of mostly older homeowners.

The New Orleans Times-Picayune's website, nola.com. The website of New Orleans' major daily newspaper, www.nola.com, posted a description of, and link to, our online survey in a prominent position on nola.com during May-June, 2007. This notice resulted in about 300 responses from all around Greater New Orleans, including from people who had not returned.

Volunteer Assistance. We have been assisted by numerous volunteer organizations in door-to-door and face-to-face interviewing. These include Operation Nehemiah, Americorps, Hands-On, Student Hurricane Network, and others. Generally, our research team partners with community organizations to utilize this volunteer assistance – and the results are then provided to the neighborhoods. Together, these volunteers have conducted about 400 completed interviews.

FEMA Trailer Parks. We have done face-to-face interviewing in FEMA and private trailer parks that house hurricane evacuees, especially in the largest of them, Renaissance Village (RV) in Baker, adjacent to Baton Rouge. Weil chairs the Congregation B'nai Israel Hurricane Relief Committee (BIHRC), which has worked at many of the evacuee trailer sites since they opened. The BIHRC established a café at RV, which became a community center with over 600 unique visitors a month, and established excellent relations with resident leaders, service providers and site management. In partnership with the resident leaders, the BIHRC put on an event at RV, with a jambalaya dinner, snowballs (snow cones), and a New Orleans brass band, which paraded through the site. Seventy volunteers came from Operation Nehemiah, and resident leaders recruited 20-30 resident volunteers. With this volunteer force, our research team was able to conduct 94 interviews with residents, who generally refuse to be interviewed otherwise, except for payment (see **Figure 6**). We have collected 100-200 interviews in this fashion and are now planning an event with evacuee parents in a Baton Rouge school, in partnership with Americorps, Hands-On, and the Mayor's office.

Schools. We have partnered with Our Lady of Prompt Succor School in Chalmette (St. Bernard), the Ursuline Academy (a Catholic girls school), and are in discussion with many other schools in the region. We provide questionnaires, which students take home to their parents. The parents fill in the survey, and the students return them to the schools, where we collect them. We have completed about 200-300 interviews in this fashion.

Other Nonprofits: Faith-Based Groups, Service and Housing Providers, Advocacy Groups. We have worked closely with many nonprofit organizations. For example, we have submitted a proposal with Providence Community Housing, which is commissioned to build mixed-income housing in place of

demolished housing projects, to conduct interviews with 400-500 respondents and to provide GIS maps, in mostly middle-to-low income African American neighborhoods. We are also working with Acorn (an advocacy group), Operation Brother's Keeper (an association of ministers), and other organizations also representing or serving middle-to-low income African American residents.

Projections. The data collection we have done up to this point has been extremely labor-intensive, and with virtually no funding so far, it has required a great deal of organization and persuasion. We have always offered to provide the groups we partner with the survey results as an incentive to assist us. This cooperation has, we believe, resulted in much better data collection than might have been possible under current circumstances, even if the research had been fully funded – both because of respondent cooperation, but also because we want to evaluate the impact that faith, community, and nonprofit organizations have on the recovery.

With the funding we have received and hope to receive from pending proposals, we do not intend to take a fundamentally different approach to data collection – because the present approach is appropriate and successful. Rather, we propose to pay student interviewers to survey groups that are willing to participate. More specifically, we would use the following general approach:

- We will continue to partner with community groups, who endorse our data collection, and to whom we will give the results. We will also continue to partner with various organizations that are able to provide volunteers.
- We will assemble teams of paid LSU student interviewers, whom we will send to New Orleans to conduct door-to-door interviewing (and also damage assessments, as needed). The students will partner with volunteer interviewers and community volunteers, who will help persuade residents to do the interview.
- We will collect contact information from respondents, to family, friends, and neighbors who are at work, have not moved back, etc. We will seek to conduct telephone interviews with these people, calling them from the LSU survey lab.
- We will continue to conduct interviews on the internet with certain groups, when appropriate. However, from experience, we believe this will be practical only in certain specific cases.

Funding sought in the present proposal would be used to collect a third survey wave to measure change over time – or a second wave if pending proposals are declined. We will continue to seek samples that are as representative as possible. Having learned a great deal from data collection to date, we feel well positioned to do an effective job of data collection and sampling in on-going survey waves.

Preliminary Results and Hypotheses. Although we still need to round out our sample to make it more representative, the sample size (N=2,300 and counting) and diversity is sufficient for preliminary analysis. Thus, we already have the basis for positing and testing a large range of causal models and hypotheses. **Figure 4** shows an overall *Causal Model* for the level of analysis that can be addressed with the survey. Examples of specific hypotheses are shown in Panel A of **Table 2**.

A.1 Those with higher damage experience more stress.

A.2 Social support mitigates/reduces stress, even among those with higher damage. Thus, for example, stress rises steeply with damage for non-church-attenders, but is flatter for church-attenders.

A.3 People express greater confidence in, and satisfaction with, their own community leaders (esp. religious, neighborhood, nonprofit) than with government officials.

A.4 Critical Mass and Tipping. People will return in higher numbers, to the extent that they expect others in their community will return; and conversely. Likewise, residents are more likely to return to the extent that their neighbors have returned; and conversely. (The hypotheses in E expand on A.4.)

Figure 5 indicates support for hypotheses A.1 and A.2; and other preliminary analysis also supports hypothesis A.3 (Schwartz 2006; Weil 2007b). These offer good, clear evidence of the importance of social capital and social organizations, and they set the stage for deeper analysis of data in the larger project we are conducting.

GIS AND SPATIAL ANALYSIS

The impact of Hurricane Katrina both at the time of landfall and during all subsequent phases leading to recovery, has caused identifiable changes on the built and social landscape. These changes present dynamically changing spatial patterns that can be layered with other geographic information such as the results of the previously described surveys, damage assessments conducted soon after landfall,

and high resolution aerial photography. A GIS will be used to combine these layers into a more holistic impression of neighborhood recovery, and to guide subsequent field data collection strategies. Curtis and Mills have extensive experience with geospatial support to both response and recovery regarding Katrina (Curtis, Mills, and Leitner 2007; Curtis, Mills, Kennedy, Fotheringham, and McCarthy 2007; Curtis, Mills, Blackburn Jason K , and Pine 2006; Curtis, Mills, Blackburn, and Pine 2006).

Spatial sample strategy design. Collecting representative assessments of physical conditions in a post-disaster situation is just as challenging as collecting survey data of people. Two of the most consistent challenges involve researcher stress in a dynamic and often fluid environment, and secondly an over reliance on pre-disaster census information that may no longer be representative of the population being studied. Information from the social surveys combined with the new geospatial field collection approaches described here will provide one of the first detailed individual and neighborhood datasets designed to not only capture who has returned, but also the myriad of information surrounding the conditions of that return.

Geospatial Recovery Assessments**.** A critical component of the research design is understanding the physical damage and recovery characteristics of respondents' homes and neighborhoods and the relationship of physical recovery with subjective-personal and social recovery. We propose to monitor respondents' recovery across multiple fronts throughout the project. We will be able to do so through issues addressed both in our social survey and through physical monitoring. By performing periodic evaluations and collecting GIS compatible photographic records of the physical recovery progress, the research aims to document a multi-temporal recovery trajectory for each of the subject buildings and their immediate surrounds. In some places, we expect that full physical recovery will have been achieved early in the study, while in others, it is anticipated that full recovery will not occur within the duration of the project. Our base hypothesis is that the speed and completeness of rebuilding is inversely proportionate to the level of damage sustained. That is, the more severe the damage, the slower and less complete the rebuilding will be. We understand this hypothesis fails to capture neighborhood complexity, and as such we follow with these further modifications:

The relationship between recovery and storm related damage is not linear. Although areas that received little to no damage may recover more quickly, it is not expected that areas receiving 75% damage recover at a 10% faster rate than those receiving 85% damage. Indeed, this is expected to be one of the key findings of this research, that the recovery process is spatially complex, with various physical, social, economic and support factors contributing more to recovery than the degree of damage sustained. For example, **Figure 7** displays the browser of the GPS enabled video system to be used in this project. This test run for Holy Cross in January 2008 (collected by Fagan, analyzed by USC) shows a destroyed house next to a home where the residents have returned. The side windows of the home overlook the devastation. While across the road (activated in the browser by simply clicking on the thumbnail) an abandoned house still displays the orange search and rescue "X".

More specifically, the hypotheses of E in Table 2 will result in identifiable spatial patterns. Also, hypothesis F.1 – "Third Places" – may actually spatially account for the apparent effects of organizations. As prior research on community development suggests, gathering places, such as shops, cafes, and other arenas for social interaction may be linked to a lower levels of income inequality, poverty, and population turnover, and other elements of well-being among local residents (Tolbert et al. 1998; Tolbert et al. 2002), Third place establishments improve socioeconomic conditions by facilitating the development of a dense network structure in the community. A dense network structure may enhance recovery, by building local problem solving capacity through collective efficacy (Sampson et al. 1999).

In addition, we hypothesize that not all recovery is sustainable and expressed as a positive linear progression starting at some point after the event. In other words, an area may appear to be moving through the stages of recovery but external factors and neighborhood effects may actually halt and even reverse this trend (for example families initially rebuilding before eventually abandoning their home). More specifically neighborhood maps of recovery will show spatial variation between survey time periods with some areas progressing, while others stagnate or reverse. In addition, a neighborhood *as a whole* may appear to be transitioning through recovery, but within city blocks, or even street segments will "recover" at varying rates as seen in Figure 7. We will also investigate whether recovery "clusters" as sequences of neighbors – do the actions of a neighbor influence a decision to return or abandon resulting in sequences of buildings displaying similar levels of recovery? These actions on the landscape will be revealed as mapped patterns.

Besides the subjective evaluations in the social surveys, these independently-measured processes will provide evidence of tipping points, thresholds, and critical masses – and through them, the influence of neighbors on each other and of organizational strategies and efforts.

Part of the GIS analysis to be performed for this research will be to reveal these patterns using newly developed field techniques that allow for exhaustive rather than sampled data collection supporting each wave of the social surveys. Until recently this has proved too costly and time consuming for traditional academic inquiry. As a result, there has been extremely little GIS related investigation into the dynamic stages of neighborhood recovery in a way that is both transferable to other disasters and useful for the development of geospatial disaster theory. As a result of working with Red Cross Disaster Assessment Teams (DAT) after Katrina, Curtis, in collaboration with the National Center for Geocomputation (NCG) in Ireland, implemented a Spatial Video Acquisition System, (SVAS) which comprises video cameras mounted to either side of a vehicle, with the audio track recording a perpetual GPS signal (Curtis, Mills, Kennedy, Fotheringham, and McCarthy 2007). These images can be uploaded into a GIS allowing for the creation of different recovery maps. NCG have developed a browser that allows for other GIS layers (for example aerial photography) to be viewed as a cursor follows the data collection path, accompanied by the actual video (Figure 7). By stopping the video, a database can be accessed so that information seen on screen is "captured" (for example, evidence of rebuilding), with that capture being linked to the frame coordinate. The general approach of using the SVAS for post-disaster recovery analysis is now established, with Curtis, Mills, Fagan and Kennedy all using the technology for their research and most recently NSF funding Curtis and Mills with a SGER grant to capture the geographic pattern of recovery after the 2007 California Wildfires.

Several partial SVAS runs have been completed for Orleans and St Bernard Parish between Spring 2006 to Spring 2008 using volunteer student labor. Although these runs have been revealing in determining the physical approaches needed to collect SVAS data, and in terms of what can be extracted from the video image, the lack of funding has resulted in a temporally and spatially sporadic rather than systematic data collection which limits cross neighborhood comparisons. In order to address this issue, Curtis and Mills have a proposal pending with NSF to complete a more systematic collection using the SVAS focused on areas surrounding specific locations relevant to other post-Katrina research, especially where mortalities and building graffiti occurred (Curtis Under review; Curtis, Mills, and Leitner 2006). This current project is not reliant on the funding of the other NSF proposal, though if it were successful, even more neighborhood comparisons could be made than being proposed here. For the current research SVAS runs will be conducted on Wednesday morning, Thursday night, and Sunday afternoon. The two daylight runs will allow for a comparison of both physical attributes of the properties, and also human involvement (actual rebuilding work or other neighborhood activities). The night run (approximately 1 hour after dusk) will allow for a better estimate of over-night recovery, lights in properties being an indication of returnees.

As it is not feasible to visit every address in the social survey within a similar time frame, we will employ a selection process, targeting neighborhoods to survey intensively (because of their representative importance demographically, organizationally, and in terms of damage). **Figure 8** displays the contoured output of a kernel density analysis which identifies hotspots of interviews collected so far into effective sampling areas. This approach will facilitate the collection of neighborhood data surrounding individual survey responses in order to capture the neighborhood recovery trend. Given previous data collection experience in terms of hours required to collect neighborhood data in Orleans Parish, the top ten neighborhoods (by this selection process) will be driven for a total of 30 collection runs.

Data extraction from the SVAS will involve "in-lab" windshield surveys using all three video runs per neighborhood and a pre-defined checklist of property attributes. These surveys will be translated into a GIS format (achieved by linking attributes to a building footprint ID) where a comparison of the three surveys will be performed. We will assess damage and recovery for structures identified using the sampling methodologies outlined below.

Social Survey Sampling and SVAS neighborhood analysis: Social survey respondents are asked to provide their address at the time of Hurricane Katrina. The addresses indicated by the surveys will be geocoded and overlaid onto the SVAS extracted property layers. If for any property the SVAS data is unclear (for example significant vegetation overgrowth obscuring the property), a field team will be dispatched to collect the missing data. Once the data are in the GIS, individual properties can be accessed (as can their immediate neighbors) to support the social survey responses. Data will also be aggregated to three further spatial units; city blocks, street segments, and expanding buffers around key

neighborhood locations including churches and service centers. *Past Damage Survey Sampling:* In order to more accurately describe the immediate post-storm damage states, past damage survey results will be reviewed including the depth of floodwater measured as a continuous variable (in feet for 25 meter square cells) and reflecting high water marks recorded by the U.S. Army Corps of Engineers and their contractors throughout the City of New Orleans, a comprehensive damage assessment of residential, commercial and industrial buildings undertaken by FEMA in the weeks following Katrina, and storm exposure by 911 calls originating from Orleans Parish for the period of August 29th to the 31st (obtained from the City of New Orleans 911 Communication Center). All three measures will be spatially matched with the neighborhoods corresponding to the social surveys, and the SVAS aggregations. Some debate surrounds the accuracy of this measure due to cut-off amounts prohibiting rebuilding. It will be interesting to see how these data correspond to the other damage assessments, the SVAS data, and even that collected on the social surveys.

Using these three methods of assessing physical damage and disaster exposure, we will develop independently-measured housing recovery estimates for each resident, both immediately following Hurricane Katrina and for each of the data phases proposed here. These estimates will be compared with social survey responses regarding repair funds and insurance coverage.

We will be able to compare respondents' subjective impressions of their damage, future risk, and likelihood of repair with the physical conditions of their specific and general environments. Respondents' reported recovery activities and expenses will be evaluated in light of both physical housing damage and calculated recovery costs. We will also analyze how subjective impressions vary across groups and other measured demographic characteristics – and we will be able to identify groups, traits, and conditions under which people evidently are not getting correct information, not assessing risks accurately, or on the contrary, may know things that we are not able to estimate using standard techniques (for example, the efficacy of group effort in making repairs).

The causal direction can possibly also be reversed, as suggested by the last example. Characteristics of individuals and communities may affect the likelihood of physical recovery. Besides group effort, it may be valuable to know about "tipping points" in recovery, as "critical masses" of people repopulate certain areas. We can make estimates simply from physical characteristics and physical return rates, but we can also obtain deeper knowledge – which respondents on the ground may have more of than we do – about who is likely to return and what people's impressions are about others' intentions.

Through estimate of building damage and physical recovery activities, we expect to address hypotheses such as those shown in Table 2, Rows B and D:

- B.1 The more damage a residence suffered, the slower and less complete the rebuilding.
- B.2 The more damage neighbors suffered (here defined by either side on the same street segment, the slower and less complete the rebuilding
- B.3 The more damage the immediate neighborhood suffered (here defined by a: the entire street segment and b: the block and associated facing street segments) the slower and less complete the rebuilding.
- D.1 The more resources (esp. money) an individual has, the faster and more complete the rebuilding.
- D.2 The more solidarity among community members – e.g., the more embedded individuals are, the more individuals work cooperatively with others, the more effective the leadership – the faster and more complete the rebuilding.
- D.3 The more complete the rebuilding, the lower the individual stress.
- D.4 The more complete the rebuilding, the more social support (social networks, embeddedness, community leadership) will recover.

Geospatial data collection, primarily using the SVAS, will be performed and processed by LSU CADGIS (*Computer Aided Design and Geographic Information Systems Laboratory*). Attributes from these SVAS runs will be translated into GIS layers in the USC GIS Lab which will also perform all other GIS support for the project. Geocoding of all survey instruments, the manipulation of the three damage measures, census and Katrina related information (for example building footprint data), and SVAS data will all be combined into a single project Geodatabase.

This geodatabase will allow the project team to test for several spatial hypotheses (for example B.1, B.2, B.3) at different scales. In addition, various cartographic displays, at different aggregations (by block, by street segment) will be used to show change in the attributes (both from the survey and the

SVAS) for each of the time periods. The described hypotheses will be investigated using the following general analytical approaches.

Analysis 1: Indices for Neighborhood Visualization & Analysis

- The average amount of vegetation overgrowth per property
- The average number of search and rescue markings per property
- The average amount of building damage per property
- The average amount of recovery activity per property
- The average number of returned properties
- The average number of transitional homes (FEMA trailers).

These indices can be aggregated by street segment, city block, or in buffers around key neighborhood locations, such as those identified in F.1. Buffers can be concentric circles extending outwards (at 250, 500 and 750 meters) or more spatially complex following street patterns and city blocks. This will facilitate the following hypothesis:

F.1 "Third Places." The proximity of physical gathering-places – e.g., undamaged or repaired schools, restaurants, places of worship, community centers – may "explain away" the effects of social-network, leadership, or organizational factors. That is, social support may only become possible when residents have places that facilitate social interaction. We employ the concept of third places here because these establishments (e.g. cafes, shops) provide an opportunity structure for developing collective efficacy and problem-solving capacity.

Neighborhood indices can be further improved by 3-Dimensional visualization of the buildings (based on numbers of floors and partial floors) using ArcScene, allowing project researchers to actually walk through street segments to approximate line-of-sight to damage (see **Figure 9**). In this way maps can be created to show how many buildings per street segment can directly see either significant damage or abandonment.

Analysis 2: Multi-level modeling

In the second portion of the analysis, neighborhood-level data will be integrated with individual-level data to assess the multilevel effect of neighborhood characteristics on individual outcomes. These models take the general form:

Individual Outcome = Individual Characteristics + Neighborhood Context

The individual outcomes in our analysis capture linear and categorically measured characteristics of the housing unit and the individual. Our housing unit outcomes include measures of rebuilding and recovery status of the housing unit. We also examine measures of individual well-being, such as stress.

The independent variables in our models are measured at two levels of analysis. At the individual-level, we include measures of age, race, sex, and socioeconomic status. Our models also control for the household characteristics of the individual, such as family composition and number of persons in the household.

At the neighborhood-level, we introduce a series of variables that measure the local context in which the individual resides. We will construct these variables by aggregating individual survey responses and integrating aggregated GIS data. These variables may include the damage sustained by the neighborhood, the recovery status of the neighborhood, the presence and type of third places in the local area, and the presence and type of religious organizations in the local area. The C Hypotheses in Table 2 (as well as F.1) are examples of these contextual effects:

C.1 The more proximate resources are – e.g., groceries, pharmacies, schools – the faster and more complete the rebuilding.

C.2 The more proximate problems are – e.g., crime, devastation in other neighborhoods – the slower and less complete the rebuilding.

Data to test both of these hypotheses will be extracted in the GIS as indices either from the SVAS, or from the social surveys calculated for the previously described spatial aggregations. For multiple event locations (for example abandoned buildings), a KDA will be run to find hotspots within each neighborhood. The outer bounds of these hotspots (similar to Figure 8) can again be used to calculate indices.

TIES TO OUR RELATED RESEARCH NOT INCLUDED IN THIS PROPOSAL

Surveys of Organizations. The larger research project in which the proposed research is embedded – *and for which no funds are sought here* – includes direct measurement of the role of

organizations. The first wave of organizational and residential surveys *have already been funded* (with Weil as PI[3]) and is currently in the field. When these data have been collected, we will merge them with our surveys of individuals, and conduct multi-level and geospatial analysis of the combined data sets. Blanchard has particular expertise in these forms of analysis (Irwin, Blanchard, Tolbert, Lyson, and Nucci 2004; Blanchard and Matthews 2006; see also Raudenbush and Bryk 2002; Raudenbush, Bryk, Cheong, and Congdon 2004).

Our collaborators, Daphne Cain and Juan Barthelemy, are conducting surveys of churches (and perhaps later, other organizations) to which respondents belong or which serve them as clients. We investigate what strategies, actions, and forms of organization leaders employ, and how effective they are, net of other factors. Cain and Barthelemy (under review) already surveyed churches in the Baton Rouge metropolitan area in the first half of 2006. Church representatives were asked to describe the tangible and spiritual relief efforts provided to evacuees following Katrina. Cain and Barthelemy have revised and expanded their survey instrument, in collaboration with Weil (see http://www.lsu.edu/katrinasurvey/CainBarthelemy-NOLAChurchSurvey.pdf). We now interview leaders of the same churches that distribute the survey to their members or clients, and we seek to interview congregation members of new churches in the sample. We expect to find variation in recovery rates among community members that can be compared with variation in strategies and practices among community leaders. By pursuing this form of analysis, we aim to identify and isolate, not the most successful communities, but rather, the *best practices*: particular courses of action that work in certain circumstances or in most circumstances. Examples of hypotheses are given in row E of Table 2.

STRATEGY OF ANALYSIS: COMBINING THE SOCIAL AND GEOGRAPHIC COMPONENTS

At the outset, we indicated that New Orleans' recovery from Hurricane Katrina rests on three legs, physical damage (negatively), economic resources, and social factors. Having sketched the elements of a measurement strategy, we now indicate how we propose to bring the pieces together in an analysis of a unified model of recovery. **Figure 10** shows such a model. In the center oval is a representation of our basic model.

The left panel of Figure 10 shows how we operationalize the *independent variables*. (a) *Physical Damage* is measured in the proposed surveys by respondent reporting and by physical assessments of residential units and application of data from flood maps to assess both the water depth and future risks at each location point. And we consider geographical factors like proximity to needed resources. We combine these factors in the GIS analysis. (b) *Economic Assets* are measured mainly at the individual level in the surveys, where we ask respondents about their employment status, income, and access to capital for rebuilding. (c) *Social Factors* are conceived in two parts. First, *Community Assets* are measured by embeddedness in networks of social support and the effectiveness of community organizations. Along with this, we will compute the gaps between individual risk perceptions and assessments derived from the SVAS, aggregate these gaps to the community level, and analyze the size of gaps across communities. A second aspect of the Social Factors can be characterized as *Social Dynamics***.** As we noted, individuals may be unwilling to return and rebuild if they believe they would be isolated; and impressions of isolation or a "critical mass" may produce self-fulfilling prophecies. We measure respondents' impressions in repeated surveys and will look for tipping points in the dynamics, as recovery proceeds or stalls. We will also measure geographical embeddedness or isolation directly from the SVAS, as a function of the distribution of recovered and non-recovered properties. We believe that these tipping points are likely to be influenced by the strategies and effectiveness of leadership, the solidarity and trust within communities leading to a sense of collective efficacy, and possible cooperation between communities or organizations. The organizational surveys (from related research) will help us measure these factors, and we will combine them in a multi-level analysis design. Also, as noted, critical mass and tipping can be considered at various levels of aggregation: at the individual level, at the block level, at the neighborhood or organizational level, and at the "universe" level of Greater New Orleans.

The right panel of Figure 10 shows how we operationalize the *dependent variables*. (a) *Material Recovery* consists of housing recovery, neighborhood revival, and economic recovery. We measure these factors with all our tools: damage and recovery assessments, GIS, individual surveys, and on-going flood risks (from existing sources). Measurement of housing repair and recovery is relatively straightforward and will be done by repeated observations (filmed and direct). Neighborhood revival will be measured by our

[3] Co-PIs are Pine, Kennedy, Cain, and Barthelemy, as noted above.

and external measures of repopulation, and the re-emergence and accessibility of neighborhood resources like grocery stores, pharmacies, schools, other retail outlets, "third places," and the like. Using GIS, we will spatially analyze these factors and will be able to draw associations between housing recovery and neighborhood revival. And economic recovery will be measured by survey questions, repeated over time, about employment, income, access to capital, as well as economic elements of the above factors. (b) *Emotional and Spiritual Recovery* will be measured mainly by our surveys of individuals. Our survey includes measures of emotional stress, manifested in physical symptoms like sleeplessness or trouble concentrating; spiritual feelings; comfort and satisfaction with family, friends, and community; as well as various subjective evaluations of respondents' communities and leaders. Because we link material and organizational indicators to individual records, we can analyze the influence of these factors from a geospatial and multi-level perspective. Thus, for instance, we should be able to evaluate whether successful leadership strategies, or geographical proximity to resources, result in greater individual emotional recovery. (c) *Community Recovery* is perhaps the subtlest element to evaluate. Some elements can be measured simply by aggregating individual-level responses. For instance, we could gauge community recovery by the extent of social support people feel, their embedded in social networks, their degree of trust or satisfaction with their leaders and communities, and similar factors. However, more sophisticated indicators can be developed, with varying degrees of difficulty. For instance, research on democracy suggests that polarized polities have more trouble resolving problems and conflicts (Weil 1989, 1994b). We can assess community polarization by measuring the dispersal of community members' evaluations of their leaders (e.g., a standard deviation), and compare communities with each other on this polarization indicator. The more polarized a community, perhaps, the lower the emotional/spiritual or even material recovery (Hypothesis E.4 in Table 2). This is a multi-level research design. Likewise, certain leadership strategies, or organizational networks may indicate a better-functioning community environment.

IMPACT ON SCHOLARSHIP AND COMMUNITY

This research aims to contribute to the theoretical and empirical literature on social capital, social organization, civic engagement, civil society, the role of the nonprofit sector, community studies, and disaster recovery, as well as make methodological contributions in the areas of data collection, multi-level and geospatial-social modeling and analysis, and scientific-community interaction and partnership. More broadly, in our larger research project, we attempt to knit together disparate fields of social, geographic, and organizational sciences in a unified approach that we hope will yield fruitful insights and methods for further research. In addition, our research attempts to bring immediate benefits to the communities we study. For example, the USC team will post SVAS data on their GIS website – either as a map hyper linked to static images, or as a video run through Google Maps. This will allow both returnees and the diaspora to receive up-to-date information about their neighborhoods. Both approaches are currently being developed at USC. We will also pass on our findings to communities as soon as we have them. But more than this, we are actively working and consulting with a wide range of communities in their recovery efforts, including the Jewish Federation, the Catholic Archdiocese, and other individual churches and faith-based organizations; organizations like ACORN and Providence Community Housing that represent mostly middle-to-lower income African American residents; the Vietnamese community of New Orleans East; the community of Chalmette in St. Bernard Parish; neighborhood association in Broadmoor, Gentilly, Lakeview, Central City, Holy Cross (in the Lower 9th Ward), among numerous others; social service organizations like Americorps and Catholic Charities; advocates for displaced musicians like Sweet Home New Orleans; resident leaders of FEMA trailer villages; and nonprofits and the Mayor's office in Baton Rouge. In all cases, we try to help groups use the information we develop for their own recovery efforts.

Incidentally, we do not believe that these efforts of cooperation and assistance will somehow "contaminate" our research. On the contrary, we expect that (1) there will still be a large amount of variance on relevant variables to be measured and analyzed, and (2) active involvement will aid our understanding of the dynamic processes we are investigating. By contributing to the recovery as participant-observers, we gain access to social processes that are often closed to us as researchers. More generally, our efforts should improve scientific-lay communication and understanding.

MANAGEMENT PLAN

The proposed research will be organized under one PIs and four co-PIs, in two disciplinary areas, at two universities, as follows. (a) The *Sociology Component* will be organized under Weil (PI) and

Blanchard. Both are faculty in the Department of Sociology at LSU and can meet, telephone and email – and do so – at frequent intervals. Weil, who specializes in survey research, political and community sociology, and social theory, will supervise data collection of the individual social surveys. The survey data will be collected partly by the LSU Public Policy Research Lab (PPRL: the LSU Survey Lab), partly by undergraduate students in the field, and possibly also by members of communities being surveyed. Weil has worked directly with the PPRL for many years on Baton Rouge area surveys and has an effective and comfortable working relationships with them. Blanchard specializes in multilevel- and GIS/spatial modeling of community dynamics, and will supervise the analysis and help coordinate the surveys with other areas of the larger project. Blanchard and Weil have worked together on several projects and work easily together. (b) The *GIS Component* will be organized under Curtis and Mills (Department of Geography University of Southern California, USC) and Kennedy, LSU, who is also Director of LSU's CADGIS Lab. Curtis specializes in the GIS and spatial analysis of health events and disasters. He is the original researcher to modify the SVAS for disaster assessment and recovery. He will oversee the SVAS analysis, though focusing on analysis while Mills organizes data processing, attribute extraction and creating the GIS. Kennedy will work with Curtis in supervising the LSU GIS work; he has also worked on several projects with Curtis improving the SVAS data collection approach. Fagan has worked in a supervisory role for FEMA during Katrina recovery before moving to become a research professor in the Disaster Science and Management where he collaborates in SVAS data collection with Curtis and Mills. Fagan will oversee and participate in the SVAS data collection runs. CADGIS also contains the (Katrina) GIS Clearinghouse Cooperative which provided geospatial data for recovery efforts and will provide this project with invaluable GIS layers. The National Center for Geocomputation, the research center which developed the SVAS software will also be involved as a technical consultant in order to manipulate the software, and provide updates (for example, web transferability) which will enhance the success of the project.

One graduate student from the LSU Sociology Department and one at USC will be available to assist with data collection, management, analysis, and coordination. Part of the budget for the PPRL also includes supervision by graduate students of undergraduate interviewers. Graduate and undergraduate students, as well as community members when feasible, will be included in all aspects and levels of the research, to the extent that they are qualified and interested. This research will provide many opportunities for scientific training and many opportunities for scientific-community interaction.

The time-line of the proposed research is straightforward. One social survey wave is already almost complete, and one or two additional waves will be conducted during the period of research, as described above. Analysis of these data has already begun. A wave of damage assessment surveys (SVAS collection runs) will follow each wave of social surveys. The first series of runs will begin immediately in order to provide baseline data for the prioritized areas used to support the social surveys. Once collected, these data will be transferred to USC where processing and attribute extraction will begin. These attributes will be combined with building data in a GIS. Joint analysis will take place from two perspectives: social surveys will be aggregated within the GIS and analyzed spatially along with other attributes; and GIS data will be analyzed as contextual or neighborhood attributes of individual respondents. Additional spatial data (e.g., locations of schools, neighborhood crime rates, flood depths and risks) will be merged with our data and analyzed in a similar fashion. (Variables from the organization surveys – from our related research – will also be merged with individual survey records in a multi-level data file, keyed to which organization an individual belongs to or is served by.) A further series of SVAS runs will either follow each social survey, or at approximately 12 month intervals, whichever yields the more runs. The LSU team will also "follow-up" in the field to any problem locations as identified by the processing at USC. In addition, if interesting patterns develop in the data collection, subsequent SVAS runs will be inserted at finer temporal periods (for example 6 month), but for only one data collection run.

Our proposed three-year research would end about six years after Hurricane Katrina. We propose to monitor recovery till near the end of this period: thus, data collection would occur during most of the proposed funding period. However, we will begin analysis and reporting almost immediately, and continue at an accelerating pace throughout the funding period. We can do so because we have already collected a fair amount of data, and have already begun analyzing and reporting them. As noted, our dissemination of results will occur not only in scholarly venues, but also to community groups, community residents and diaspora (through the Internet), first responders and recovery specialists, and, as warranted, to the press (see, e.g., Nolan 2007).

Table 1. Partners in Survey Sampling: Examples

Partners	Examples
Faith-Based membership groups	*Catholic Archdiocese.* Endorsed survey and put a notice in weekly bulletin to parish church leaders. Varying partnership with individual parish churches, including very close with large churches in Lakeview and Chalmette (ca. N= ca. 600 together), and moderate with churches in Metairie and Gentilly.
	Jewish Federation. Active support and assistance by Federation and Synagogues. Rs contacted by email, answered on web. N=713
	Various African-American churches & organizations, e.g., Operation Brother's Keeper.
	Other denominations, incl Episcopalian Diocese and United Methodists. New Orleans Baptist Theological Seminary has discussed cooperation.
Other Faith-Based Groups	*Operation Nehemiah* volunteers went door-to-door, conducting face-to-face interviews. N=100-150.
	Cong. B'nai Israel Hurricane Relief Committee, partnered with resident leaders and volunteers at Renaissance Village and other trailer villages. N=100-150
Service Providers, Nonprofits, and Volunteer Agencies	*Catholic Charities of N.O. and Baton Rouge,* through their Community Centers and case managers
	Capital Area United Way (Greater Baton Rouge) is distributing the survey through their 52 member service provider organizations.
	Americorps, Hands-On, Student Hurricane Network, and others. Generally, partner with community organizations to utilize volunteer assistance.
	Sweet Home New Orleans, an agency that assists New Orleans musicians.
Community Groups and Neighborhood Associations	*Broadmoor Improvement Association* has distributed survey by email, on website, at neighborhood meetings, and door-to-door.
	Fr. Nguyen The Vien and Mary Queen of Vietnam Catholic Church and Community Development Corp. Questionnaire translated into Vietnamese; interviews currently being done, directed by community leadership.
	A couple dozen NBH assns, including in Lakeview, Pontilly, eastern New Orleans, Central City, Gert Town, Holy Cross (Lower 9th Ward), Treme/Lafitte.
Advocacy Groups	*ACORN.* Volunteers are conducting telephone interview among the roughly 2-3,000 Acorn members from the Acorn offices. Acorn will also facilitate community interviewing.
Rs Reached directly, without Associations	*New Orleans Times-Picayune*: their nola.com community forums posted a link to the survey. N=ca. 400.
Indirect Assistance	*Steven Bingler,* Concordia LLC and the Unified New Orleans Plan. He also organized the Community Center Consortium, which led to other contacts
Government Agencies and Agency Contracts	*Providence Community Housing*. Commissioned to build mixed-income housing to replace housing developments. We have submitted joint proposal with PCH to do surveys & damage assessments in the Tremé/Lafitte area.
	Various *Schools* are sending the paper questionnaire home with students to their parents to fill in and return. N=200-300 from initial efforts.
	FEMA VALs (Voluntary Association Liaisons) have been very helpful.
	New Orleans City Council members have helped us distribute surveys and/or introduced us to community leaders.
	The Baton Rouge Mayor's office has partnered with us.
	Louisiana Recovery Authority (LRA) may work with us. We are in discussions.

Table 2. Examples of Specific Hypotheses

Data Level	Examples of Specific Hypotheses
A. Social (Individual)	1. Those with higher damage experience more stress. 2. Social Support mitigates/reduces stress, even among those with higher damage. Thus, for example, Stress rises steeply with damage for non-church-attenders, but is flatter for church-attenders. 3. People will express greater confidence in, and satisfaction with, their own community leaders (esp. religious, neighborhood, nonprofit) than with government officials. 4. Tipping and Critical Mass. People will return in higher numbers, to the extent that they expect others in their community will return; and conversely. Likewise, residents are more likely to return to the extent that their neighbors have returned; and conversely.
B. Damage Assessments	1. The more damage a residence suffered, the slower and less complete the rebuilding. 2. The more damage neighbors suffered (here defined by either side on the same street segment, the slower and less complete the rebuilding 3. The more damage the immediate neighborhood suffered (here defined by a: the entire street segment and b: the block and associated facing street segments) the slower and less complete the rebuilding.
C. Geographical	1. The more proximate resources are – e.g., groceries, pharmacies, schools – the faster and more complete the rebuilding. 2. The more proximate problems are – e.g., crime, devastation in other neighborhoods – the slower and less complete the rebuilding.
D. Social-Material	1. The more resources (esp. money) an individual has, the faster and more complete the rebuilding. 2. The more solidarity among community members – e.g., the more embedded individuals are, the more individuals work cooperatively with others, the more effective the leadership – the faster and more complete the rebuilding. 3. The more complete the rebuilding, the lower the individual stress. 4. The more complete the rebuilding, the more social support – social networks, embeddedness, community leadership – will recover.
E. Social-Organizational	1. The more effective organizational leadership is, the faster and more complete the recovery, as measured in rebuilding and stress levels. 2. Organizational leadership can be broken down into discrete strategies and actions. Thus, discrete hypotheses become possible: a. Communities will differ as to whether collective or individual effort is more effective. b. Communities will differ as to whether decentralized or centralized decision-making is more effective. E.g., congregational denominations may have more effective decentralized decision-making, while hierarchical denominations may have more effective centralized decision-making. 3. The more effective organizational leadership is, the lower the gap will be between (a) individuals' perceptions and (b) engineers assessments of flood risk, recovery chances, etc. The reason for this is that effective leadership disseminates accurate information more effectively. 4. The more polarized a community's membership is – the more internal conflict there is – the slower and less complete the recovery.
F. Social-Geographical	1. "Third Places." The proximity of physical gathering-places – e.g., undamaged or repaired schools, restaurants, places of worship, community centers – may "explain away" the effects of social-network, leadership, or organizational factors. That is, social support may only become possible when physical structures are available where people can gather.

Figure 1. Diagram of Research Plan

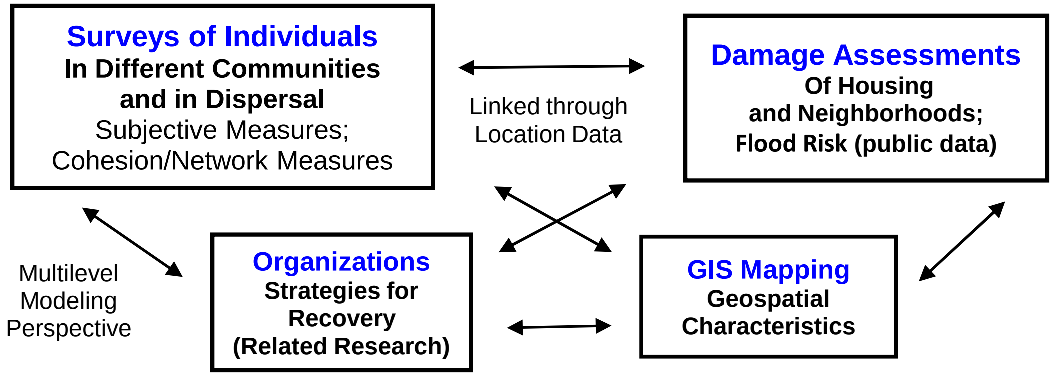


Figure 2. Sample Composition: Surveys of Individuals

Pre-Katrina Residence	%	Race	%	Income	%
Orleans	56	White	72	Under $25,000	12
Jefferson	20	Black	24	$25,000 to $50,000	24
St. Bernard	17	Asian	1	$50,000 to $75,000	21
Plaquemines	1	American Indian	1	$75,000 to $100,000	21
St. Tammany	5	Other	2	$100,000 to $200,000	18
Other	1			More than $200,000	4
N = 2,099		**N = 1,518***		**N = 1,388***	

*Excludes Jewish sample

Figure 3. Geographical Distribution: Surveys of Individuals (partial)

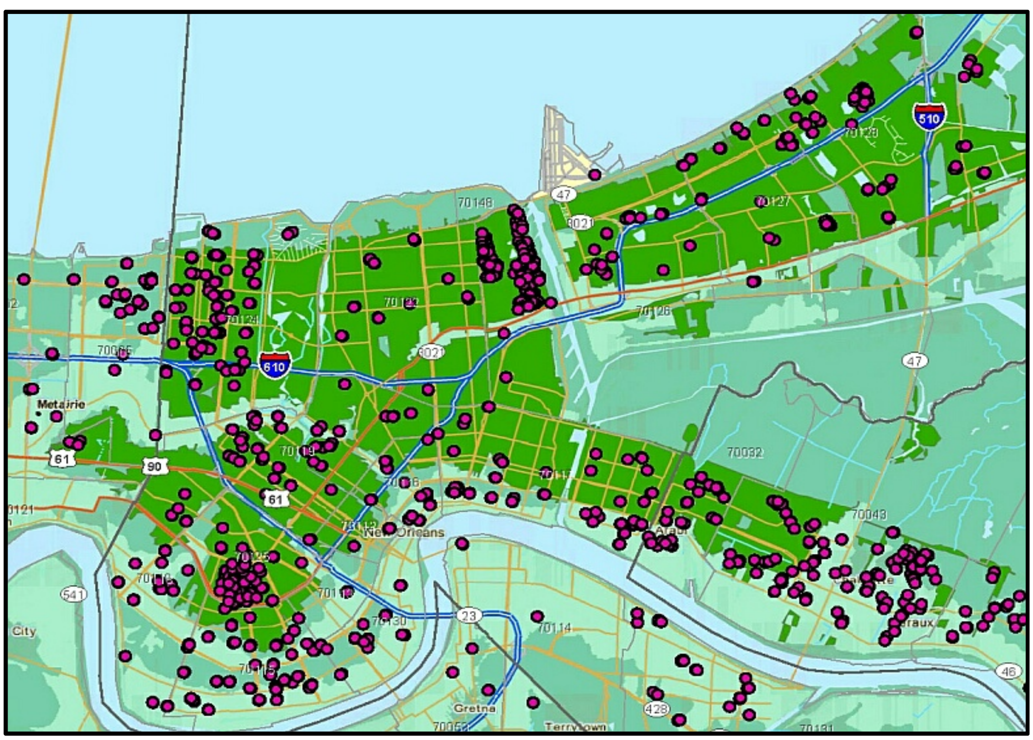
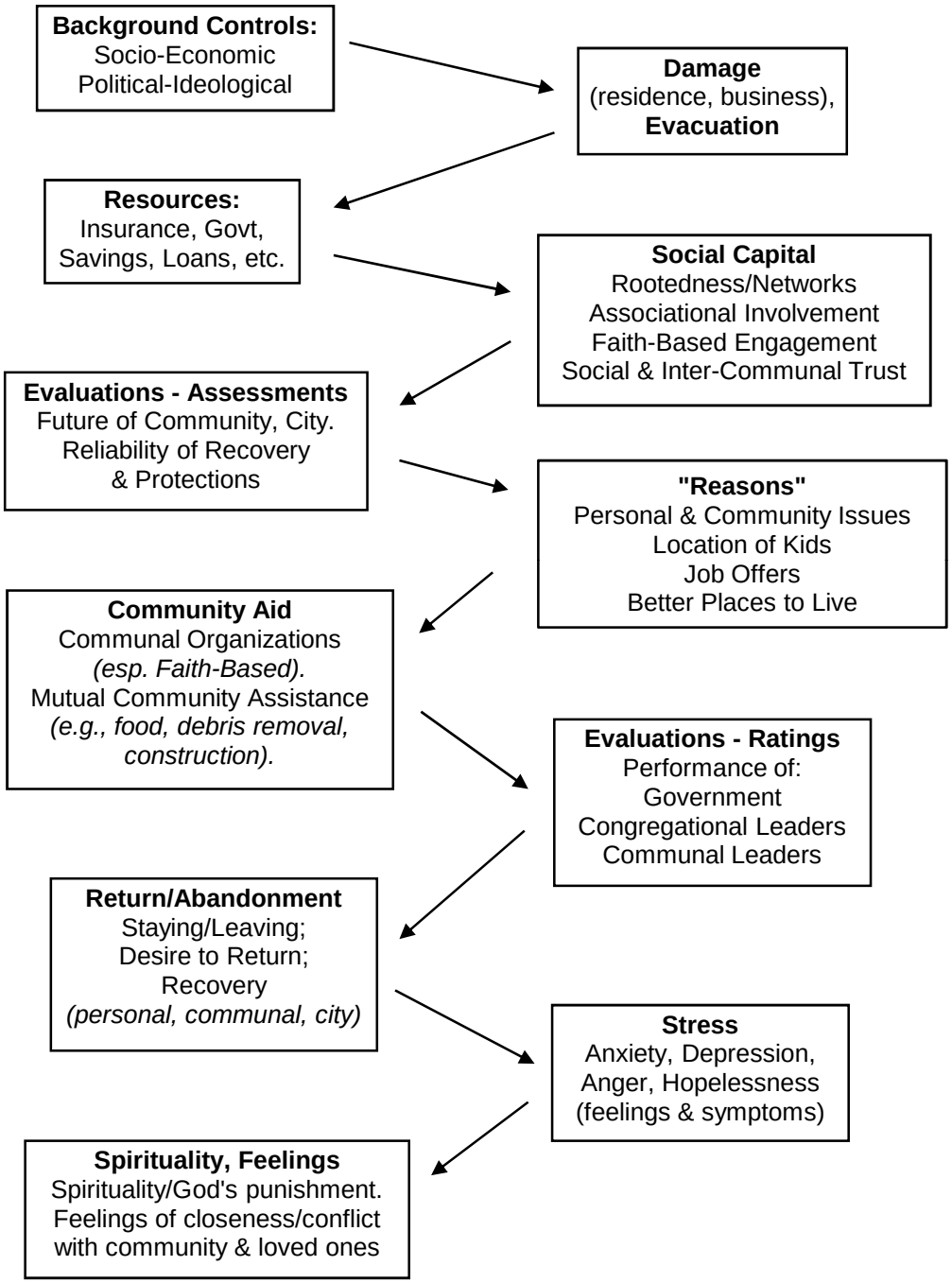


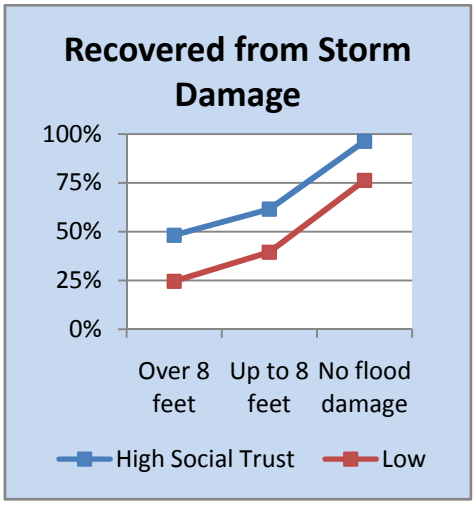
Figure 4

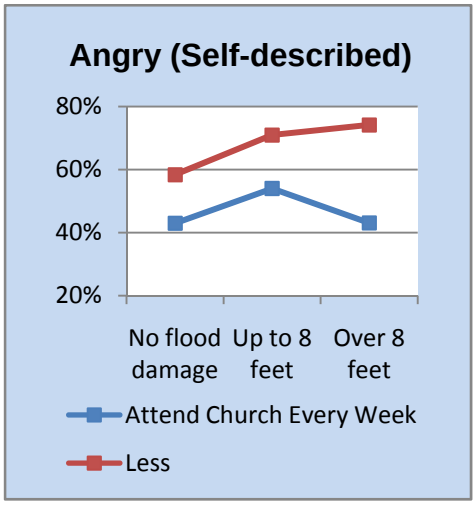
Causal Model* of Recovery from Disaster: Post-Katrina New Orleans
Employing Individual-Level Social Surveys

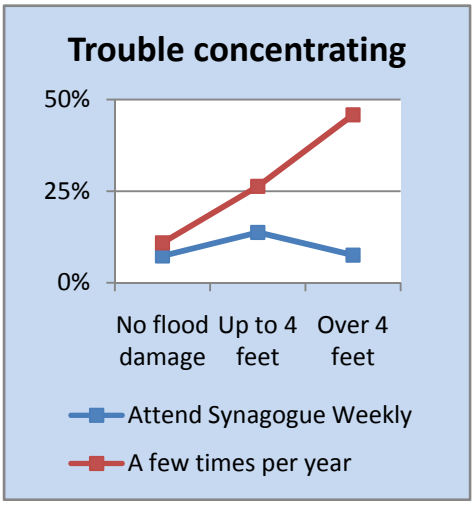


*Note: Causal order, as shown here, is hypothesized to be plausible, but may differ from this order. Preliminary analysis, using data collected since June 2006 from a variety of communities supports the hypotheses in this model.

Figure 5. Effects of Social Capital (Trust and Embeddedness) on Disaster Recovery and Stress Reduction, Net of Damage Sustained (Preliminary Findings)







General Sample (N = 1,245) **General Sample (N = 1,245)** **Jewish Sample (N=713)**

Figure 6. Images of Data Collection: Renaissance Village, FEMA Trailer Park, July 26, 2007 (N=94)

Figure 7. Browser display of Spatial Video Acquisition System, (SVAS): Video capture, combined with perpetual GPS signal.

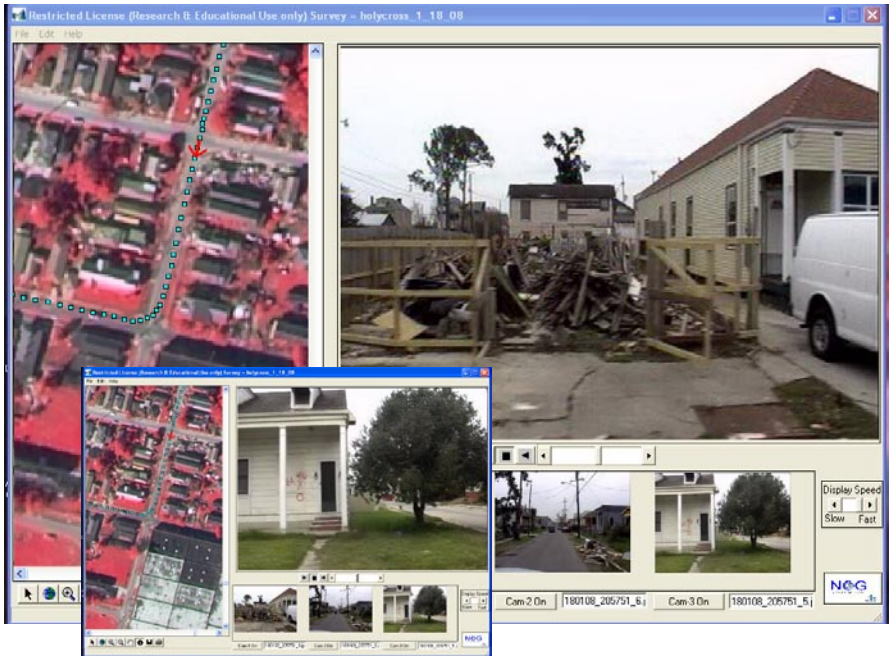


Figure 8. Contoured output of a Kernel Density Analysis for the social surveys collected so far (see Fig. 3).

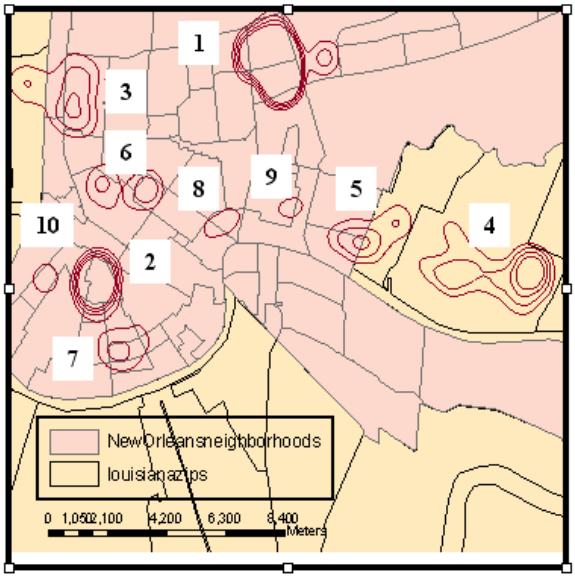


Figure 9. ArcScene Rendering of buildings by floors, with properties, with returnees colored in blue, overlaid onto an average degree of destruction for each city block.

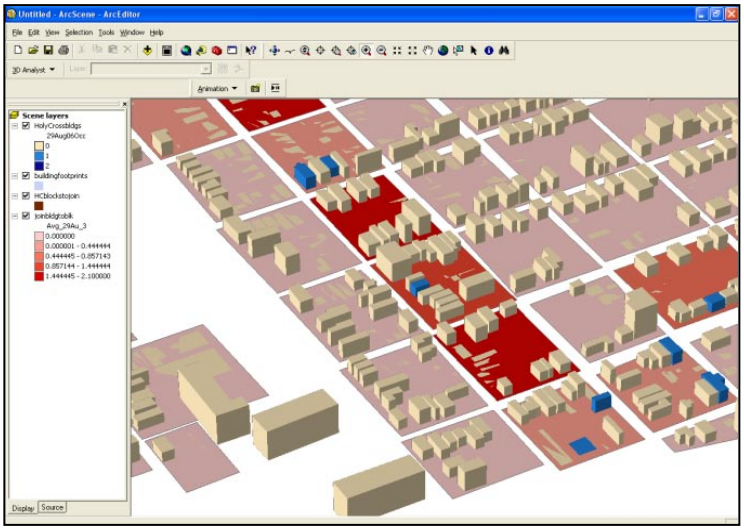


Figure 10

Causal Model of Recovery from Disaster: Post-Katrina New Orleans

A Multi-Method, Multi-Level Model,
Employing Social & Organizational Surveys, Damage Assessments, and GIS Mapping