The Resilience Activation Framework: a Conceptual Model of How Access to Social Resources Promotes Adaptation and Rapid Recovery in Post-disaster Settings

David M. Abramson, PhD MPH
Lynn M. Grattan, PhD
Brian Mayer, PhD
Craig E. Colten, PhD
Farah A. Arosemena, MPH
Ariane Bedimo-Rung, PhD MPH
Maureen Lichtveld, MD

Abstract

A number of governmental agencies have called for enhancing citizens' resilience as a means of preparing populations in advance of disasters, and as a counterbalance to social and individual vulnerabilities. This increasing scholarly, policy, and programmatic interest in promoting individual and communal resilience presents a challenge to the research and practice communities: to develop a translational framework that can accommodate multidisciplinary scientific perspectives into a single, applied model. The Resilience Activation Framework provides a basis for testing how access to social resources, such as formal and informal social support and help, promotes positive adaptation or reduced psychopathology among individuals and communities exposed to the acute collective stressors associated with disasters, whether human-made, natural, or technological in origin. Articulating the mechanisms by which access to social resources activate and sustain resilience capacities for optimal mental health outcomes post-disaster can lead to the development of effective preventive and early intervention programs.

Address correspondence to Lynn M. Grattan, PhD, School of Medicine, University of Maryland, Baltimore, USA. Email: lgrattan@som.umaryland.edu.

David M. Abramson, PhD MPH, National Center for Disaster Preparedness & Mailman School of Public Health, Columbia University, New York, USA.

Brian Mayer, PhD, College of Social and Behavioral Sciences, University of Arizona, Tucson, USA.

Craig E. Colten, PhD, Department of Geography and Anthropology, Louisiana State University, Baton Rouge, USA.

Ariane Bedimo-Rung, PhD MPH, School of Public Health, Louisiana State University Health Sciences Center, New Orleans, USA.

Farah A. Arosemena, MPH, School of Public Health and Tropical Medicine, Tulane University, New Orleans, USA.

Maureen Lichtveld, MD, School of Public Health and Tropical Medicine, Tulane University, New Orleans, USA.

Journal of Behavioral Health Services & Research, 2014. 42–57. DOI 10.1007/s11414-014-9410-2

Introduction

Scholarly and programmatic interest in individual and community resilience has grown exponentially over the past 50 years. What began as a focus in the field of developmental psychology to understand how children may thrive despite growing up in adverse conditions or with parents who have schizophrenia[1,2] has expanded to embrace a broad political interest in cultivating resilience in both individuals and communities facing a variety of chronic and acute stressors,[3,4] examinations of biological and epigenetic pathways in which resilience may be expressed,[5,6] and efforts within sociology and social epidemiology to describe and operationalize the multilevel aspects of communal and institutional protective and promotive factors that can influence an individual's well-being and capacity to adapt to adversity.[7–9] Furthermore, political calls for enhancing the resilience of the citizenry as a means of preparing populations in advance of disasters or complex emergencies, and as a counterbalance to social and individual vulnerabilities, has compelled many agencies and federal sectors to consider how to cultivate resiliency. For example, the Centers for Disease Control and Prevention (CDC) released guidance to states in 2011, requiring that states and their local health departments develop community resilience as one of 15 public health emergency preparedness capabilities, while the National Research Council advocated community resilience-building as a key component of disaster mitigation strategys.[10–12]

This increasing drumbeat of interest in individual and communal resilience presents a challenge to the research and practice communities: to develop a translational framework that can accommodate multidisciplinary scientific inquiries within the concept of resilience that can be applied in post-disaster settings using observational and quasi-experimental strategies, and which have clear applications for programmatic interventions. The objective of this article is to present a conceptual framework that can serve as the basis for testing how access to social resources, such as formal and informal social support and assistance, can promote positive adaptation or reduced psychopathology among individuals and communities exposed to the acute collective stressor of a technological disaster, in this case the 2010 Deepwater Horizon Oil Spill (DWHOS). It is the product of a research enterprise that encompasses four university consortia of scientists at 13 institutions engaged in 12 distinct studies, working in concert with community coalitions. Each research project is examining different aspects of human exposure to the oil spill and its health effects. Through the establishment of a Resilience Working Group (RWG), these four Gulf Coast Research Consortia developed a common resilience research framework with which to model and test resilience theories, allowing the group to assess resilience across the individual research projects. The foundation of the Resilience Activation Framework (RAF) is grounded in distinguishing resilience processes (the ability to withstand, adapt, or recover quickly from a disaster), individual and community resilience attributes, and the factors which facilitate the activation of those resilience attributes. The RWG proposes that preventive and early intervention programs should bolster the resilience mechanisms that are activated and sustained by access to social resources, thereby supporting optimal mental health outcomes post-disaster. The consortia are developing the RAF to address a common research question: How does access to, or engagement with, social resources facilitate the activation of resilience attributes that contribute to positive mental health?

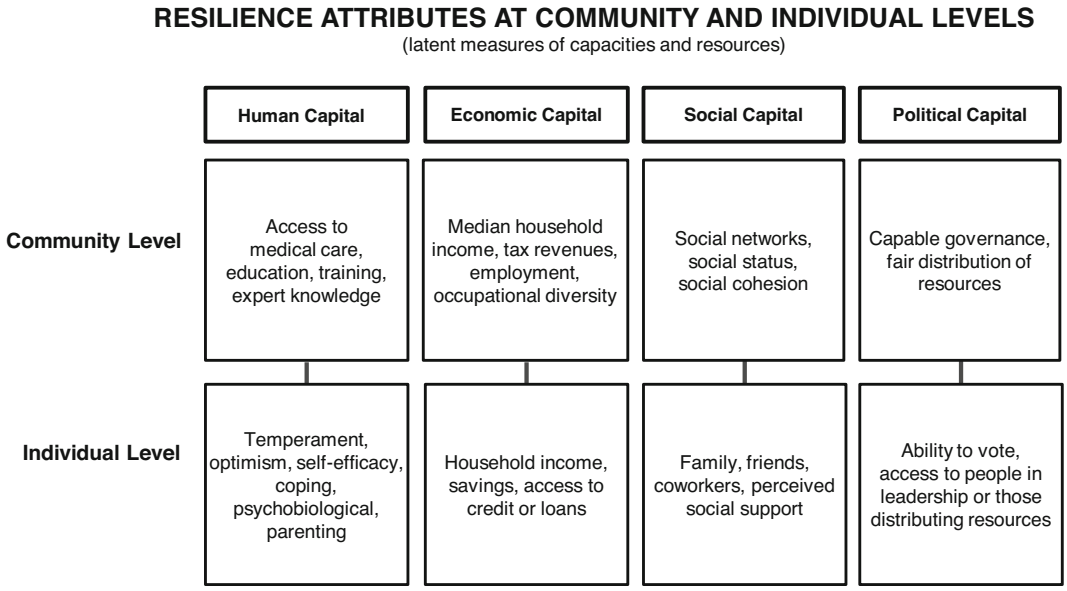
Background

The Gulf Coast communities of Texas, Mississippi, Louisiana, Alabama, and Florida are at risk for significant adverse mental health outcomes as a result of exposure to the DWHOS and related persistent stressors from previous adverse events and recurring life challenges. Despite diverse occupational, regional, and subsistence lifestyles, all of these communities share strong economic, social, and cultural ties to the Gulf of Mexico and its renewable resources. These communities

were significantly impacted by the DWHOS environmental disaster and continue to experience uncertainty regarding future environmental, economic, health, and social impacts. Early DWHOS studies documented negative mental health outcomes in selected Gulf Coast subpopulations in the immediate aftermath of the spill (e.g., Abramson et al.[13]; Gill et al.[14]; Grattan et al.[15]). Similarly, studies of community reactivity are underway in select regions documenting signs of community conflict, corrosion, and economic distress.[14,16,17] However, despite the fact that (1) the resources of the social/community environment are strong mediators of post-disaster mental health in the individual, and (2) communities are made up of individuals who bring a wide range of psychological reactivity to community adaptation, no research to date has comprehensively addressed the link between how mental health is shaped by attributes of individual and community resilience, and whether there are means of activating such resilience through informal social supports and through health- and social system interventions.

Recent definitions have approached resilience as a process rather than an outcome; for example, resilience as "the capacity of a system to withstand or recover from significant disturbances that threaten its adaptive function, viability or development."[18] The *system* is scalable: it may be an individual, a household, a community, an institution, or a nation-state. Furthermore, there are two distinct elements in such a resilience process. First, there has to be a "significant disturbance" sufficient to disrupt or destroy the system. Second, the system's resilience *capacity* is then revealed by how well it is able to withstand, adapt, or recover quickly from the potentially traumatic event. Resilience attributes are those traits and characteristics of a system that permit it to conserve or marshal its resources. Figure 1 illustrates these attributes as functions of four types of "capital"—human, economic, social, and political—that may be present at individual or collective levels. The framework is based on the notion that a resilient individual or community has the capacity and capability to maintain, re-establish, acquire, or exchange these critical resources.

Figure 1
Resilience attributes at community and individual levels

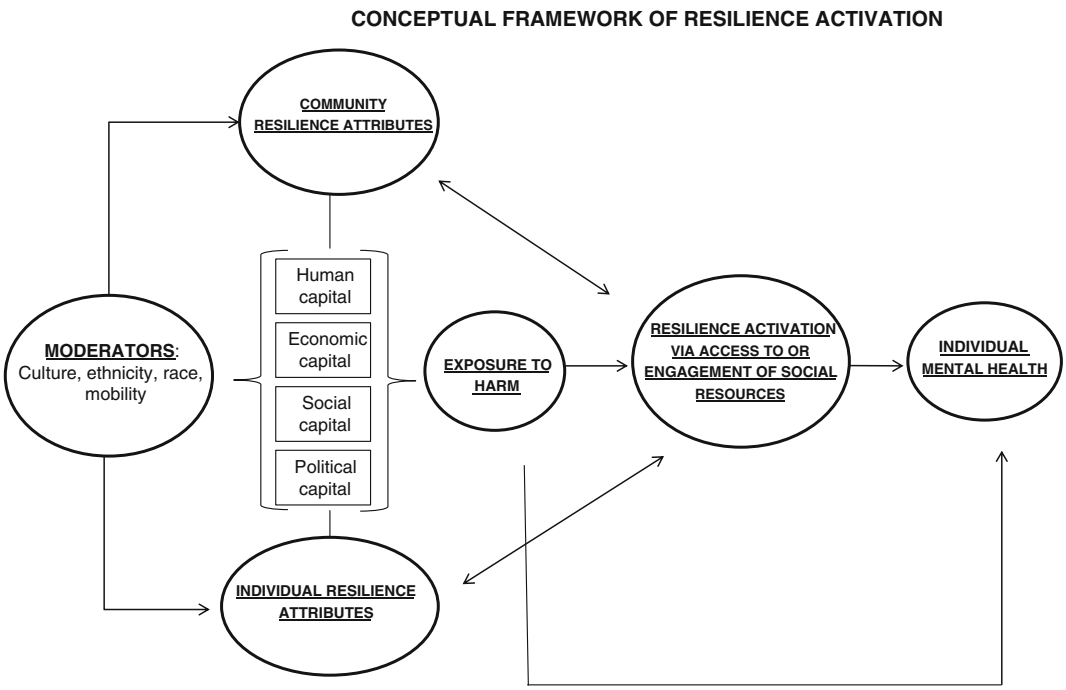


In an effort to develop a hypothesis-driven framework, it is assumed that in the face of a stressor these resources can be deployed by individuals and communities to counter the effects of the event. For example, an individual with good health (human capital), adequate insurance and savings (economic capital), and a strong social network (social capital) will be able to call upon all of these resources to help buffer the effects of a catastrophic event. Communities with highly effective and equitable government infrastructures (political capital), ready access to public and private funding sources (economic capital), and communal norms of neighborliness or collective self-efficacy (social capital), should be similarly positioned to buffer a stressful event. The use of these resources may be an expression of an individual or community's resilience attributes (e.g., an individual with a high-degree of coping self-efficacy may be less likely to suffer mental health distress), or it may be accessed by specific resilience actions (such as an individual activating his or her social network in order to identify transitional housing).

This conceptual framework is predicated upon the following premises, each of which will be explored in greater detail in subsequent sections: (1) exposure to harm leads to resource loss, stress, and psychological reactivity; (2) most people are inherently resilient; (3) community resilience attributes interact with individual resilience attributes; (4) access to or engagement with community/social resources can activate inherent individual resilience attributes; (5) this activation takes place within the context of a sociocultural milieu (cultural, racial, ethnic, and other social attributes, and geographic mobility) that moderates resilience capacity; and (6) components of the individual, community, and sociocultural milieu can be quantified and measured in order to test various components of the framework.

Building upon the research efforts of the RWG with the DWHOS and other disasters to date, a conceptual framework is proposed (illustrated in Figure 2) hypothesizing that access to social resources (e.g., for information, social support, spiritual guidance, health and human services) can

Figure 2
Conceptual framework of resilience activation



activate resilience attributes that are inherent in individuals and communities, and doing so lead to better psychological adjustment, health, and well-being.

Premises of the Resilience Activation Framework

Exposure to harm leads to resource loss, stress, and psychological reactivity

Large-scale disasters are relatively common events with catastrophic consequences for many people. In the "face" and "wake" of disaster, individuals may suffer the loss of loved ones, health, homes, financial stability, social support, sense of stability, and other resources important to daily living.[19] As a result, impacted people demonstrate a wide range of psychological reactivity ranging from brief, transient distress to long-term psychopathology. The chain of events that links disaster to mental health and behavioral problems is neither simple nor linear. In contemporary psychology, however, a reasonable starting point for explaining this dynamic process is Hobfoll's Conservation of Resources (COR) model of stress and adaptation.[20,21]

The COR model postulates that people are *driven* to acquire, preserve, or protect valued resources. These resources include objects (car, house), conditions (marriage, seniority), personal characteristics (self-esteem, optimism), and engergies (time, knowledge, money), which facilite the ability to acquiring other important entitites. When these resources (or ways to access them) are lost, threatened, or not gained when expected, this will cause stress and potentially lead to negative mental health or behavioral outcomes. Many of these negative outcomes result in a time-limited stress response with a brief, transient disruption of functioning followed by resilient adaptations. The proposed Resiliance Activation Framework illustrates the case where human capital (health, coping, emotional reactivity), community capital (social networks, services, churches), economic capital (savings, job stability, credit), or political capital (relationship with community leaders) are strong and provide adequate resources to support the pre-disaster adaptive capacities in the individual. However, more severe and persistent behavioral or psychological problems may result from disaster, most notably, anxiety, depression, and post-traumatic stress disorder (PTSD).[19,22,23] These more debilitating problems often evolve after a period of chronic excessive stress that taxes the coping resource of the individual over time. To explain this process, the COR model would argue that persistent resource loss (and the inability to gain new resources) may lead to rapid resource loss cycles, which people are unable to reverse, and a downward spiral of behavioral health problems ensues.[24] Essentially, the initial loss of a valued resource increases the individual's vulnerability to further losses. For instance, a loss of tranportation and health may lead to lost job security, reduced self-esteem, financial distress, marital and family pressures, and subsequent feelings of helplessness and hopelessness. Because the COR theory embraces so many aspects of individual, community, and sociocultural entities, it has found considerable support after a wide variety of disasters,[22,25–28] including the DWHOS.[15,29,30]

To advance the application of the COR model in disaster recovery, it is essential to identify the specific resources (or combination thereof) necessary for activating or enabling critical resilience attributes. Thus far, it is generally well accepted that economic and social capital are essential to the resilience process. Specifically, economic resource loss, socioeconomic adversity, and/or loss of job opportunities have been consistently associated with the most severe, lasting, and pervasive psychological effects or the onset and course of depression, anxiety, and number of PTSD symptoms after disaster.[15,22,26,27,31–34] Similarly, the convergence of data suggests that social deterioration (post-disaster declines in social embeddedness, social support, and trust in others)[35–38] has also been associated with worse psychological outcomes. Testing the Resilience Activation Framework from diverse perspectives within the DWHOS consortia will enable the examination of these as well as other facets of the resilience processes to determine how they interact with individual attributes to facilitate resilience.

Most people are inherently resilient or have the capacity to be resilient

Beginning in the 1970s, a distinct and well-established field of resilience research emerged from the discipline of developmental psychology, in which a number of investigators sought to identify the factors and traits that enabled children to achieve appropriate developmental milestones or avoid psychopathology even in the face of adverse circumstances or trauma.[2,39,40] Among the most durable findings from this scholarship was the normative response of children to be resilient, what Masten[2] referred to as "Ordinary Magic," rather than the notion that resilience represented some unique representation of invulnerability. Similar research developed among adult populations.[41] A short list of factors associated with an individual's ability to adapt to chronic and acute adverse circumstances emerged from a number of studies of children and adults, and includes personality factors (e.g., hardiness, self-efficacy, self-esteem), attitudinal factors (e.g., positive worldview, faith, altruism), attachment factors (e.g., communal solidarity, social support, connections to competent adults or peers), cognitive factors (e.g., intellectual and reasoning abilities), and specific adaptation and coping skills (e.g., including stress-reduction competencies).[42–44] Wright and colleagues refer to this scientific phase of the identification of resilience factors as the first of four waves of resilience research to date.[44] The subsequent waves of resilience research encompass an understanding of the complex processes that activate or facilitate resilience, an evaluation of the interventions that stimulate resilience, and, more recently, the epigenetic and neurobiological mechanisms of resilience activation.[5,6,45]

Common to many of these studies is the notion that these individual traits contribute to adaptation and recovery responses when an individual adult or child is confronted with extreme stressors or "potentially traumatic events."[42] Masten[2] has distinguished the ways that such traits operate, either as moderators whose existence in a pre-disaster phase can help an individual withstand the effects of a traumatic event or as risk-activated moderators whose latent characteristics are mobilized in response to a traumatic event, and which can in turn help the individual adapt or recover quickly from the stressor's effects.

The RAF illustrated in Figure 1 builds upon both the Conservation of Resources theory described above and the latency of resilience attributes that may be "activated." The COR theory is predicated on a deficit model, in that many of the factors that have been associated with increased mental health distress and psychopathology reflect a depletion, disruption, or chronic lack of access to critical resources or "capitals." In Norris and colleagues'[19] review of 160 disaster studies, the individual characteristics associated with poor mental health outcomes included female gender, low socioeconomic status, minority status, and prior psychological distress or disability, among others. The authors also note that an individual's lack of, or lost belief in his or her ability to cope or control outcomes, and having few social resources are also associated with poor mental health. Silove and Bryant[46] observe that disasters often lead to social disengagement, loss of social identity, and loss of meaning and existential coherence as social ties and institutions have been severed or destroyed. For example, a school teacher who has been displaced by a disaster and who is unable to work now adopts the social role of victim or refugee, and loses the representation by self and others of the social role of teacher. These factors all reflect deficits, in which social, economic, or human capital has been diminished.

The Resilience Activation Framework (Fig. 2) incorporates both the resource deficit model (often conceptualized as a vulnerability model) and the notion of latent resilience attributes. The framework suggests two pathways by which access to social resources can activate resilience processes: one in which the deficits are addressed by increasing the individual or community assets or facilitating access to them, and the other pathway in which the provision of formal or informal social resources enhances or activates positive adaptive traits.

Community resilience attributes interact with individual resilience attributes

Community resilience can be defined as the enduring *capacity* of geographically, politically, or affinity-bound communities to define and account for their vulnerabilities to disaster and develop *capabilities* to prevent, withstand, or mitigate for a traumatic event.[8,47] A community's capacity is dependent upon its access to human, economic, political, and social capital.[47,48] At a collective level, human capital refers to access to a healthy and capable population; economic capital involves access to money and other financial instruments and assets; political capital connotes access to both capable governance and to those institutions that influence the distribution of resources; and social capital may be defined as a community's access to local institutions and networks that promote collective cohesion and self-efficacy. As community resilience is conceived of as an ongoing process, much emphasis is placed on a community's ability to actively engage its population in developing capabilities through the enhancement of these four areas.

In the pre-disaster phase, a community's latent resilience *attributes* would include the strength of the population's health (human capital); the density and integration of formal and informal social networks and community-wide information pathways (social capital); the identification of and hedging against community-wide risk using insurance and mitigation strategies (economic capital); and the effectiveness and efficiency of local government to achieve community consensus and equitably distribute and manage public resources (political capital). In the post-disaster phase, the *activation* of these resilience attributes could include the following: establishing access to quality health and mental health systems (human capital); developing or capitalizing on emergent mechanisms to facilitate access to social networks, such as social media group work, or leveraging and integrating networks of trusted community-based organizations (social capital); the establishment of equitable processes for facilitating productive public discussions and prioritization of collective actions (political capital); and the ability to acquire and distribute public and private funds (economic capital).

Norris and colleagues[8] point out that community *resiliency* should be conceptually treated as distinct from *resistance*, wherein the resources available within a community are capable of mitigating any negative impact of a collective shock such as a disaster. Whereas effective community planning is intended to prepare for the generally expected short-term disasters such as floods, fires, and earthquakes,[49] community resilience suggests that a social system should adapt to and recover from the unexpected.[8,48,50,51] When community resistance to disaster fails, multiple systems of preparedness collapse, producing a greater shock than a community typically experiences.[52] Thus, in order to be truly resilient, a community needs to be able to adapt, evolve, or grow in ways that enhance disaster preparedness capability.[53] Enhancing community resilience then requires both the improvement of macro-level social factors such as education, employment, and population well-being while also facilitating strong and reliable partnerships between a diverse array of public, private, governmental, and nongovernmental organizations.[47] These partnerships can serve to mobilize community members during and after a crisis event so that the community population has access to critical information and necessary resources to facilitate preparedness and recovery.

While there is general consensus that *community resilience* can be seen as the ability of communities to link individuals to key social resources, there is less clarity on how to measure these capacities and capabilities.[9] Building on the work of Norris et al. and others,[8] Sherrieb and colleagues[9] propose that a general lack of quality secondary macro-level data on communities limits effective measurement to the areas of economic and social capital. In their *community resilience index* based on the measurement of economic and community social capital data available at the county level, they develop a useful measure of the relationship of resources to the process of resilience. Other measures, such as the "coastal community resilience index" used by the National Oceanic and Atmospheric Administration, the "community resilience program" used by

the American Red Cross, or the "community resilience system" developed by the Community and Regional Resilience Institute are similarly limited by being location and disaster-specific. Advances in the measurement of community resilience, especially those theoretically modeled on communities' capacity to link individuals to vital recovery resources are focusing on the measurement of social networks that link individuals within a community to each other as well as to key institutions. Although no secondary data is widely available to planners and policy-makers, rapid protocols for assessing the density of social networks and their capacity to mobilize resources in the event of a disaster are currently under development and promise to provide more accurate accounts of communities' capacity to improve individual well-being through the enhancement of community resilience.[54]

Access to or engagement with social resources can activate resilient attributes

Most stress and disaster recovery models argue that people who have access to better social resources or social support are better able to resist the deleterious effect of post-disaster stress.[24,30,36,37] The proposed conceptual framework for resilience activation hinges on the ability of better social resources to activate resilience attributes toward maintaining pychological vitality, stability, and mental health as well as adequate physical health and well-being. Using *social support* (actual or perceived), as a potential activator of resilience, it is anticipated that family cohesion and warmth, strong social networks, and connection and bonding with others who are coping well in the post-disaster environment should enhance the resilience process, resulting in better behavioral outcomes. Social support could potentially activate resilience processes by providing knowledge and assistance for practical needs, helping with perspective taking for reasoning and problem solving, promoting positive emotions and attitudes associated with resilience (e.g., self-esteem, self-efficacy, optimism), facilitating adaptive coping behaviors, helping to regulate negative emotional states through providing respite, and/or helping to find a greater meaning or purpose in the situation.[31,55,56]

Activation of resilience attributes takes place within the context of a sociocultural milieu

Exploring the cultural context of resilience among Gulf Coast communities is intrinsic to the success of public health interventions in promoting and activating resilience across the disaster-prone region.[57,58] Early scholarship on human resilience sought to distinguish it from ecological resilience and pointed the way toward community-based resilience, but did little to parse out the role of culture. Adger[59] notes that several key elements separate biophysical and human resilience. Human institutions, he argues, are absent in ecological systems, and they offer human communities a persistent mechanism for coping with disruption.[59] These institutions, whether religious, ethnic, or legal, provide a means for individuals and communities to sustain resilient capacities and to pass that wisdom on to subsequent generations through social memory.[60,61] As human constructs, these institutions reflect cultural influences and are largely local in scale. Thus, they mediate how a community prepares for and responds to a disruption and activates its resilient capacities. From the community level, culture, ethnicity, and race are prime mechanisms for enabling and perpetuating resilience. Important lessons learned in the aftermath of both domestic and global disasters have confirmed the pivotal role of culture in resource supply as well as redevelopment practices. Community-embedded institutions, such as faith-based organizations and cultural affinity groups, often serve as asset mapping agents, facilitating access to portfolios of resources in a just-in-time culturally tailored fashion.

Over the past few years, resilience studies have provided more insight into the cultural context. Communities with deep cultural and subsistence roots in places have demonstrated the capacity to "manage resilience" on the fly through adaptation.[62–64] Repeated hurricane strikes, along with

other environmental disruptions, have impacted Louisiana's coastal minority communities over the past several centuries. Yet, these natural resource-based communities have persisted in the face of extreme environmental circumstances.[65–67] At the core of their adaptive success have been ethnic and cultural ties that provide essential networks through church and kin connections, and an enduring attachment to place that drove individuals' desire to stay and adapt as a cultural community. These linkages enable mobility, both economic and geographic, to cope with and rebound from disruption. Successful adaptation may require the extension of social institutions across ethnic lines and over long periods of time, which is possible at the community level. Furthermore, inherent resilience that pre-dates formal programs is rooted in local practices that are finely attuned to local conditions, which enables communities to perpetuate themselves in place, even without top-down efforts.[63,68]

Individual, community, and sociocultural milieu can be quantified or measured

In individuals, resilience in the face of disaster, adversity, or overwhelming disadvantage is a multifaceted process. There are resilient people, resilient behaviors (e.g., coping), and resilient outcomes. Thus, resilience has been studied as a personality or character trait, a process, and an outcome. Although the theory far out paces robust construct measurements, assessments of personality characteristics such as self-efficacy[25] and self-reported resilience[69] have been associated with better post-disaster mental health outcomes.[15,70] Promising measures for studies to test the Resilience Activtion Framework may also included those which assess various attitudes associated with resilience such as optimism[71] and positive emotions,[55,56,72,73] which have also been able to distinguish between people with successful and unsuccessful adaptation after extreme stress.

Resilient behaviors have been predominantly studied by measuring the efficacy of a person's coping efforts, distinguishing between the traditional notions of problem- and emotion-focused strategies.[74,75] After a disaster, problem-focused coping strategies are thought to have a greater association with resilient outcomes than emotion-focused or avoidant strategies. While this association is supported from both rational and theoretical perspectives, with the exception of a few studies,[15,22,76] there is limited consistency in the disaster literature about which coping behaviors are better than others after a disaster. This is most likely due to the many biopsychosocial factors associated with the coping process, the tendency for most people to use a wide range of coping strategies in the face of extraordinary challenges (making it difficult to determine which were the most helpful), and the fact that effective coping behaviors often vary with the changing post-disaster situational demands. Lastly, the Resilience Activation Framework does not presume that resilient outcomes are limited to the absence of mental illness. Positive outcomes could include the presence of ongoing psychological vitality, good health, satisfactory quality of life, family functioning, maternal bonding, or general well-being.

The measurement of social capital is typically divided into two approaches. Whole network analysis focuses on the interactions between people within a socially or geographically bounded group, such as a classroom or office.[77] Those using this approach hypothesize that the interactions occurring within the bounded space affect some outcome, in this case social resources in times of disaster. The method involves getting some measure of interaction between members of the whole network. The other approach is called personal or egocentric network analysis. With this approach, researchers do not think the outcomes are restricted to social influence within a socially or geographically bounded space.[78] Instead they see individuals as living within social contexts that vary in size, with people who of varying characteristics arranged around them in different ways. For linking individual and community resiliency, neither approach alone is ideal. A new method being developed uses an overlapping personal network approach. Initially, respondents from the communities provide personal networks using the typical method, then a set of personal networks

of respondents from a bounded space are merged by name and compositional characteristics to yield a whole network for the community. This approach is based on research that shows how some members of a whole network can accurately report on the structure of interactions within the whole network and charactertize the flow of resources within its structures.[79,80]

From a sociocultural perspective, proxy measures of resilience, such as demographic and economic change, have been used at the national and community scale,[81,82] but other evidence offers insight into adaptive capacity over long periods of time. Historical legal documents, for example, document the presence or absence of community resilience in the wake of disruptive events.[63] For example, after a 1930s oil spill destroyed their oyster beds, local oystermen capitalized on familial and cultural ties by going to work on their relatives' and neighbors' shrimp boats. Several methods exist for measuring such cultural historical resilience. One relies upon primary or secondary texts, including interviews with individuals who experienced disruption and participated in the response and recovery, or historical records, such as newspapers, local government body proceedings, and government accounts of how a community coped with hazard events.[68,83–85] By tracing the continuation or disappearance of resilient practices, one can test whether or not a community is perpetuating its resilience.

Another method to assess sociocultural aspects of resilience is through the investigation of cultural consonance: the degree to which indivduals approximate, in their own beliefs and behaviors, prototypes for belief and behavior that are encoded in shared cultural models. This method incorporates a two-pronged approach: first, implementing cultural domain analysis, and later cultural consensus analysis.[86–88] Increasing understanding of the specific disaster-associated stressors, culturally shared histories, and beliefs associated with adversity, and the contributions of their cumulative life circumstances will advance knowledge about how culture may inhibit or activate individual and community resilience, influence health, and improve quality of life across various settings.[89,90]

Implications for Behavioral Health

The integrated resilience research framework as described provides unique, transdisciplinary opportunities for behavioral interventions. Although the impact on future interventions are likely to be predicated on the anticipated research findings, the Resilience Activation Framework provides a roadmap for action that could potentially impact behavioral health intervention practice, policy, and research.

Impact on behavioral health intervention practice

Communities along this country's Gulf Coast have faced decades of interdependent challenges that directly affect the health of residents and their communities: lack of preparedness for natural disasters and the impact of those disasters on physical and mental health well-being; persistent health disparities specifically related to chronic health conditions, such as cancer and asthma, in addition to birth outcomes, such as preterm birth and low birth weight; and historical environmental contamination exacerbated by the aftermath of Hurricanes Katrina, Rita, and Isaac. While progress has been made in documenting those challenges, the solutions to date have employed narrow, "silo-driven" research designs, lacked a community-based participatory approach, and failed to produce sustainable, ecological, system-driven solutions. In addition, previous studies of environmental disasters largely indicate that although the physical effects of environmental disasters are usually the major source of concern, psychological effects of these disasters can be more significant.[91]

In general, disaster-related behavioral interventions have not yet fully benefited from a comprehensive integration of community context, assets, and "state of resilience." *Timing and*

type of intervention activities affect frontline disaster behavioral health practice. For example, most behavioral interventions to date have been implemented *post*-disaster, and in most instances focused on a single adverse mental health condition (e.g., stress, PTSD) at the individual level. As depicted in Figure 2, the effectiveness of behavioral interventions that aim to strengthen resilience are influenced by an individual's or community's capacity (attributes), their capability to activate those capacities, and ultimately the extent to which such interventions strengthen resilience as manifested, for example, in improved mental health. Hence, post-disaster interventions in isolation of assessing the state of the supporting attributes *pre*-disaster of the individual's or community's capacity to activate those attributes *post*-disaster are unlikely to improve mental health and consequently resilience in a sustained fashion. For instance, the efficacy of behavioral programs, such as the Crisis Counseling Assistance and Training Program (CCP, activated under the Stafford Act with funding from FEMA and coordinated by SAMHSA), could potentially be made stronger and more enduring by incorporating broader data-based elements of the Resilience Activation Framework. Specifically, *post*-disaster CCP interventions, such as community-based outreach and psycho-educational services, could be enhanced by linking *individual-level interventions* (improving coping strategies, stress management, or problem solving skills; referrals to more comprehensive mental health care) to broader community resilience activities and partnerships (interventions targeting specific, relevant social networks and community systems) that may serve to activate and sustain adaptive behaviors. This may be accomplished through emergent Long Term Recovery Committees that are perpetuated in a disaster's aftermath or through community coalitions developed in advance.

The success of any behavioral intervention hinges on built-in scalability to the scope and type of hazard as well as the degree of community engagement in all aspect of the intervention—from design to evaluation. Furthermore, particularly in Gulf Coast communities, the extent to which an intervention is embedded in the local culture and utilizes existing assets will significantly influence both short-term effectiveness and long-term sustainability. The design of these interventions should create accessibility by considering population variabilities, such as differences in language or functional and cognitive abilities, so as not to impede individuals with special needs. Messages promoting behavioral interventions should be developed with such vulnerabilities in mind.

Behavioral interventions aimed at strengthening resilience in the context of disasters must transcend the traditional medical model and adopt a culturally sensitive, community-based approach as the preferred *type* of intervention. Beyond improving individual mental health, *community-based* behavioral interventions are uniquely poised to build on the characteristics a resilient community must have to "bounce back" from a disaster, promote what a community must do daily to create these characteristics pre-disaster, and, most importantly, increase a community's capability to "forecast" so that its members can be well-positioned for the next challenge. Targeting communities as the recipients of behavioral interventions has the important added advantage of fostering a more transdisciplinary approach to psychosocial health. For example, adopting a biopsychosocial model prenatally not only expands the spectrum of intervention to early development, but also widens the focus of the intervention to the family unit by promoting positive "influencers" such as maternal warmth as a moderator of prenatal stress on child outcome.[92] Likewise, the extension of an anthropological model of psychosocial stress that focuses on the modifying effect of culture provides a promising avenue to address disaster-related stress in Gulf Coast communities where cultural context is likely to serve as an enabler of resilience at both the individual and community levels.[86,87]

Impact on behavioral health intervention policy

The National Disaster Management System represents a top-down, hierarchical approach to providing aid to communities with support requested from the Federal level by a governor and

subsequently delivered through state and local agencies to individuals in communities. The National Response Plan is composed of several Emergency Support Services (ESF) outlining how post-disaster aid flows from the federal level to state and local agencies and, ultimately, to communities.[93] Behavioral health care is provided under ESF 8-Public Health and Medical Services. From a policy perspective, the plan stipulates that services are provided *in response* to a disaster or *during* a potential or actual emergency. This current construct hampers access to behavioral health interventions for communities such as those along the Gulf Coast who have experienced successive trauma and need mental health support during the extended recovery phase rather than only immediately post-disaster.

Superimposed on the lack of behavioral health care in the context of disasters is a fragile health system in general and that supporting mental health, specifically. To complement these limited resources, especially in vulnerable populations, the National Academy of Sciences (NAS) proposed a conceptual model to build community resilience through private–public collaboration.[12] The model represents a paradigm shift in several key areas and articulates a set of guidelines and strategies which are reflected in the proposed Resilience Activation Framework (Fig. 2). Key among the strategies fostering private–public collaboration are the integration of capacity building within the community (activating attributes), employing a community-based systems approach, strengthening resilience through education and training in partnership with educational institutions, and creating flexible funding and resource allocation policies. The underlying premise implied by this guidance is that to be effective and have sustained positive health outcomes, behavioral interventions should be accompanied by private–public partnerships aimed at activating community capacity, and targeted education and information dissemination. These "resilience-focused" private–public partnerships may represent a desirable change in policy since those can serve as both a deployable portfolio of assets in the pre-disaster period as well as a sustainable resource during a prolonged recovery stage.

Impact on behavioral health intervention research

In its 2011 publication on "Building Community Disaster Resilience through Private–Public Collaboration," the NAS concluded that, "A nation is resilient when it is made up of resilient communities" (p. 10).[12] Integral to achieving this goal is assuring disaster behavioral health interventions are based on the most contemporary science. Among the recommendations for future research by NAS are focus areas highly relevant to the proposed Resilience Activation Framework: research that results in quantitative risk and outcome markers, projects which strengthen community resilience, and document best practices. In addition, advancing the science base by producing nationally applicable data that examines the interdependence of vulnerability and resilience has a high likelihood of providing behavioral health practitioners with tailored, evidence-based tools.

Given the multiple levels at which the RAF operates, these tools could potentially guide the systematic outcome studies of a wide range of interventions designed to enhance resilience or related capacities in individuals and families in crisis. Depending upon the type of disaster involved, this could include, but not be limited to enhanced, outcome studies of hardiness, stress inoculation or learned optimism training; social support; well-being therapies; or other psycho-educational interventions. Data from the RAF model could also lead to the development of new rationally based interventions with diverse populations within the context of their culture, taking into consideration community, economic, and political resources as well as the specific type of disaster. Importantly, as guided by the model, these therapies, psycho-educational interventions, and messages would need to be tailored to specific populations including infants, children, adults, older adults, as well as those with functional access needs and the burden of mental health and substance abuse challenges.

Conclusion

In the aftermath of the Deepwater Horizon Oil Spill, the Substance Abuse and Mental Health Services Administration and the National Institute of Environmental Health Sciences at the National Institutes of Health embarked on a series of collaborative and integrated research projects to increase understanding of the mechanisms by which access to social resources activate and sustain resilience capabilities after disaster. The Resilience Activation Framework was developed by the participating research consortia to serve as a unifying heuristic in which to frame the authors' collective research, to strengthen the interdependency of the supporting research projects, and to provide a common language in which to assess the results and implications for both policy and interventions.

Acknowledgments

Support for this project comes from the National Institute of Environmental Health Sciences awards: U19ES020683, R5U19ES020677, U19ES020676, and 1U01ES021497. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of the National Institute of Environmental Health Sciences (NIEHS) or the National Institutes of Health. We gratefully acknowledge the support and contributions of Lorien Baker, Sparkle Roberts, and Sailor Holobaugh from the Neurology Department at the University of Maryland for their assistance in the preparation of this paper, as well as Chris Mundorf from the Department of Global Environmental Health Sciences at Tulane University. We thank Jenny Hay and Alexandra Giancarlo from the Department of Geography and Anthropology at Louisiana State University for their manuscript contributions. In addition, the leadership of Edward J. Trapido and Edward S. Peters from the School of Public Health at Louisiana State University, and J. Glenn Morris from the Emerging Pathogens Institute, University of Florida is greatly appreciated in the implementation of this project. The members of the Resilience Working Group of the Gulf Coast Research Consortia are also grateful for the help and support of NIEHS officers Claudia Thompson, Allen Dearry, and Symma Finn. The views expressed in this article, however, are solely those of the authors.

Conflict of Interest None

References

1. Garmezy N, Masten AS, Tellegen A. The study of stress and competence in children: a building block for developmental psychopathology. *Child Development* 1984; 55(1): 97-111.
2. Masten AS. Ordinary magic: resilience processes in development. *American Psychologist* 2001; 56(3): 227-38.
3. Obama B. *National Preparedness*. Presidential Policy Directive/PPD-8. Washington, DC: The White House. Available online at http://www.dhs.gov/xabout/laws/gc_1215444247124.shtm. Published March 30, 2011. Accessed 2 May 2011.
4. United Nations Office for Disaster Risk Reduction. *Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters*. Report presented at the World Conference on Disaster Reduction, Kobe, Hyogo, Japan, January 18–22, 2005. Available online at http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf. Accessed 17 June 2013.
5. Shonkoff J. Leveraging the biology of adversity to address the roots of disparities in health and development. *Proceedings of the National Academy of Sciences* 2012; 109(2): 17302-17307.
6. Yehuda R, Flory JD, Southwick S, et al. Developing an agenda for translational studies of resilience and vulnerability following trauma exposure. *Annals of the New York Academy of Science* 2006; 1071: 379-396.
7. Abramson DM, Park YS, Stehling-Ariza T, et al. Children as bellwethers of recovery: dysfunctional systems and the effects of parents, households, and neighborhoods on serious emotional disturbance in children after Hurricane Katrina. *Disaster Medicine and Public Health Preparedness* 2010; 4(Supplement_1): S17-27.
8. Norris FH, Stevens SP, Pfefferbaum B, et al. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology* 2008; 41:127-150.
9. Sherrieb K, Norris F, Galea S. Measuring capacities for community resilience. *Social Indicators Research* 2010; 99(2): 227-247.

10. Centers for Disease Control and Prevention. *Public Health Preparedness Capabilities: National Standards for State and Local Planning.* Atlanta, GA: Office of Public Health Preparedness and Response, 2011. Available online at http://www.cdc.gov/phpr/capabilities/Capabilities_March_2011.pdf. Published on March 21, 2011. Updated July 22, 2011. Accessed 18 June 2013.
11. National Research Council. *Disaster Resilience: A National Imperative*. Washington, DC: National Academies Press, 2012.
12. National Research Council. *Building Community Disaster Resilience through Private-Public Collaboration*. Washington, DC: National Academies Press, 2011.
13. Abramson D, Redlener I, Stehling-Ariza T, et al. *Impact on children and families of the Deepwater Horizon oil spill: Preliminary findings of the Coastal Population Impact Study*. National Center for Disaster Preparedness Research Brief 2010_8. Available online at http://www.ncdp.mailman.columbia.edu/files/NCDP_Oil_Impact_Report.pdf. Published August 3, 2010. Accessed 7 May 2013.
14. Gill DA, Picou JS, Ritchie LA. The *Exxon Valdez* and BP oil spills: a comparison of initial social and psychological impacts. *American Behavioral Scientist* 2012; 56(1): 3-23.
15. Grattan L, Roberts S, Mahan W, et al. The early psychological impacts of the Deepwater Horizon oil spill on Florida and Alabama communities. *Environmental Health Perspectives* 2011; 119(6): 838-843.
16. Freudenberg W, Gramling R. *Blowout in the Gulf: The BP Oil Sill Disaster and the Future of Energy in America.* Cambridge, MA: MIT Press, 2010.
17. Lee MR, Blanchard TC. Community attachment and negative affective states in the context of the BP Deepwater Horizon disaster. *American Behavioral Scientist* 2012; 56(1): 104-127.
18. Masten AS. Resilience in children threatened by extreme adversity: Frameworks for research, practice, and translational synergy. *Development and Psychopathology* 2011; 23(02): 493-506.
19. Norris FH, Friedman MJ, Watson PJ, et al. 60,000 disaster victims speak: part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry* 2002; 65(3): 207-239.
20. Hobfoll SE. Conservation of resources: a new attempt at conceptualizing stress. *American Psychologist* 1989; 44(3): 513-524.
21. Hobfoll SE. 2002. Social and psychological resources and adaptation. *Review of General Psychology*; 6(4): 307-324.
22. Arata CM, Picou JS, Johnson GD, et al. Coping with technological disaster: an application of the Conservation of Resources model to the *Exxon Valdez* oil spill. *Journal of Traumatic Stress* 2000; 13(1): 23-39.
23. Norris FH, Perilla JL, Riad JK, et al. Stability and change in stress, resources, and psychological distress following natural disaster: findings from Hurricane Andrew. *Anxiety, Stress, and Coping* 1999. 12(4): 363-396.
24. Hobfoll SE, Lilly RS. Resource conservation as a strategy for community psychology. *Journal of Community Psychology* 1993; 21(2): 128-148.
25. Benight CC, Ironson G, Klebe K, et al. Conservation of resources and coping self-efficacy predicting distress following a natural disaster: a causal model analysis where the environment meets the mind. *Anxiety, Stress, and Coping* 1999; 12(2): 107-126.
26. Freedy JR, Shaw DL, Jarrell MP, et al. Towards an understanding of the psychological impact of natural disasters: an application of the Conservation Resources Stress model. *Journal of Traumatic Stress* 1992; 5(3): 441-454.
27. Freedy JR, Saladin ME, Kilpatrick DG, et al. Understanding acute psychological distress following natural disaster. *Journal of Traumatic Stress* 1994; 7(2): 257-273.
28. Galea S, Tracy M, Norris F, et al. Financial and social circumstances and the incidence of course PTSD in Mississippi during the first two years after Hurricane Katrina. *Journal of Traumatic Stress* 2008; 21(4): 357-368.
29. Buttke D, Vagi S, Schnall A, et al. Community Assessment for Public Health Emergency Response (CASPER) one year following the Gulf Coast oil spill: Alabama and Mississippi. *Prehospital and Disaster Medicine* 2012; 27(6): 496-502.
30. Palinkas LA. A conceptual framework for understanding the mental health impacts of oil spills: lessons from the *Exxon Valdez* oil spill. *Psychiatry* 2012; 75(3): 203-222.
31. Bonanno GA, Galea S, Bucciarelli A, et al. What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal of Consulting and Clinical Psychology* 2007; 75(5): 671-682.
32. Kaniasty K, Norris FH. In search of altruistic community: patterns of social support mobilization following Hurricane Hugo. *American Journal of Community Psychology* 1995; 23(4): 447-477.
33. Nandi A, Tracy M, Beard JR, et al. Patterns and predictors of trajectories of depression after an urban disaster. *Annals of Epidemiology* 2009; 19(11): 761-770.
34. Ozer EJ, Best SR, Lipsey TL, et al. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin* 2003; 129(1): 52-73.
35. Kaniasty K. Predicting social psychological well-being following trauma: the role of postdisaster social support. *Psychological Trauma: Theory, Research, Practice, and Policy* 2012; 4(1): 22-33.
36. Kaniasty K, Norris FH. A test of the social support deterioration model in the context of natural disaster. *Journal of Personality and Social Psychology* 1993; 64(3): 395-408.
37. Norris FH, Kaniasty K. Received and perceived social support in times of stress: a test of the social support deterioration deterrence model. *Journal of Personality and Social Psychology* 1996; 71(3): 498–511.
38. Ruggiero KJ, Amstadter AB, Acierno R, et al. Social and psychological resources associated with health status in a representative sample of adults affected by the 2004 Florida hurricanes. *Psychiatry* 2009; 72(2): 195-210.
39. Garmezy N. Stress resistant children: the search for protective factors. *Recent research in developmental psychopathology* 1985; 4: 213-233.
40. Rutter M. Protective factors in children's responses to stress and disadvantage. *Annals of the Academy of Medicine, Singapore* 1979; 8(3): 324-38.
41. Bonanno GA. Clarifying and extending the construct of adult resilience. *American Psychologist* 2005; 60(3): 265-267.
42. Bonanno GA, Diminich ED. Annual research review: positive adjustment to adversity—trajectories of minimal-impact resilience and emergent resilience. *Journal of Child Psychology and Psychiatry* 2013; 54(4): 378-401.
43. Masten AS, Narayan AJ. Child development in the context of disaster, war, and terrorism: pathways of risk and resilience. *Annual Review of Psychology* 2012; 63: 227-257.

44. Wright MOD, Masten AS, Narayan AJ. Resilience processes in development: four waves of research on positive adaptation in the context of adversity. In: S Goldstein, RB Brooks (Eds). *Handbook of Resilience in Children*. New York: Springer, 2013, pp. 15-37.
45. Shonkoff JP, Boyce WT, McEwen BS. Neuroscience, molecular biology, and the childhood roots of health disparities. *Journal of the American Medical Association* 2009; 301(21): 2252-2259.
46. Silove D, Bryant R. Rapid assessments of mental health needs after disasters. *Journal of the American Medical Association* 2006; 296(5): 576-578.
47. Chandra A, Acosta J, Meredith LS, et al. *Understanding Community Resilience in the Context of National Health Security: A Literature Review*. WR-737-DHHS. Santa Monica, CA: RAND Corporation; 2010. Available online at http://www.rand.org/content/dam/rand/pubs/working_papers/2010/RAND_WR737.pdf. Accessed 10 January 2011.
48. Bruneau M, Chang SE, Eguchi RT, et al. A framework to quantitatively assess and enhance the seismic resilience of communities. *Earthquake Spectra* 2003; 19(4): 733-752.
49. Longstaff PH. *Security, Resilience, and Communication in Unpredictable Environments Such as terrorism, Natural Disasters, and Complex Technology*. Cambridge, MA: Harvard University, 2005. Available online at http://pirp.harvard.edu/pubs_pdf/longsta/longsta-p05-3.pdf. Accessed 17 June 2013.
50. Allenby B, Fink J. Toward inherently secure and resilient societies. *Science* 2005; 309(5737): 1034-1036.
51. Bonanno GA. Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist* 2004; 59(1): 20-28.
52. Longstaff PH, Armstrong NJ, Perrin K, et al. Building resilient communities: a preliminary framework for assessment. *Homeland Security Affairs* 2010; 6(3): 1-23.
53. Pfefferbaum RL, Reissman DB, Pfefferbaum B, et al. Factors in the development of community resilience to disasters. In: M Blumenfield, RJ Ursano (Eds). *Intervention and resilience after mass trauma*. Cambridge, England: Cambridge University Press, 2008, pp. 49-68.
54. Mayer B, McCarty C. A Protocol for Rapid Appraisal of Community Social Structure. Poster presented at the Gulf of Mexico Oil Spill and Ecosystem Science Conference, New Orleans, LA, January 21, 2013.
55. Frederikson BL, Tugade MM, Waugh CR, et al. What good are positive emotions in crises? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *Journal of Personality and Social Psychology* 2003; 84(2): 365-376.
56. Tugade MM, Fredrickson BL. Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology* 2004; 86(2): 320-333.
57. Chandra A, Williams M, Plough A, et al. Getting actionable about community resilience: the Los Angeles County Community Disaster Resilience Project. *American Journal of Public Health*, 2013; 103(7): 1181-1189.
58. Olson S. *Increasing National Resilience to Hazards and Disasters: The Perspective from the Gulf Coast of Louisiana and Mississippi: Summary of a Workshop*. Washington, DC: National Academies Press, 2011.
59. Adger WN. Social and ecological resilience: are they related? *Progress in Human Geography* 2000; 24(3): 347-364.
60. Adger WN, Hughes TP, Folke C, et al. Social-ecological resilience to coastal disasters. *Science* 2005; 309(5737): 1036-1039.
61. Colten CE, Sumpter AR. Social memory and resilience in New Orleans. *Natural Hazards* 2009; 48(3): 355-364.
62. Bures R, Kanapaux W. Historical regimes and social indicators of resilience in an urban system: the case of Charleston, South Carolina. *Ecology and Society* 2011; 16(4): 16.
63. Endfield GH. The resilience and adaptive capacity of social-environmental systems in colonial Mexico. *Proceedings of the National Academy of Sciences* 2012; 109(10): 3676-81.
64. Walker B, Holling CS, Carpenter SR, et al. Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society* 2004; 9(2): 5.
65. Burley D, Jenkins P, Laska S, et al. Place attachment and environmental change in coastal Louisiana. *Organization & Environment* 2007; 20(3): 347-366.
66. Colten CE. Floods and inequitable response: New Orleans before Katrina. In: R Roger and G Massard-Guilbaud (Eds). *Environmental and Social Justice in the City: Historical Perspectives*. Cambridge, UK: White Horse Press, 2011, pp. 113-129.
67. Laska S, Woodell G, Hagelman R, et al. At risk: the human, community and infrastructure resources of coastal Louisiana. *Journal of Coastal Research* 2005; 44: 90-111.
68. Colten CE, Hay J, Giancarlo A. Community resilience and oil spills in coastal Louisiana. *Ecology and Society* 2012; 17(3): 5.
69. Campbell-Sills L, Stein M. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *Journal of Traumatic Stress* 2007; 20(6): 1019-1028.
70. Benight CC, Harper ML. Coping self-efficacy perceptions as a mediator between acute stress response and long-term distress following natural disasters. *Journal of Traumatic Stress* 2002; 15(3): 177-186.
71. Scheier MF, Carver CS. Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychology* 1985; 4(3): 219-247.
72. Izard CE. *Human Emotions.* New York: Plenum, 1977.
73. Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology* 1998; 54(6): 1063-1070.
74. Folkman S, Lazarus RS. An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior* 1980; 21(Sept.): 219-239.
75. Lazarus RS, Folkman S. *Stress, Appraisal, and Coping*. New York: Springer, 1984.
76. Silver RC, Holman EA, McIntosh DN, et al. 2002. Nationwide longitudinal study of psychological responses to September 11. *Journal of the American Medical Association*; 28(10):1235-1244.
77. Borgatti SP, Mehra A, Brass D, et al. Network analysis in the social sciences. *Science* 2009; 323(5916): 892-895.
78. McCarty C, Molina JL, Aguilar C, et al. 2002. A comparison of social network mapping and personal network visualization. *Field Methods*; 19: 145-162.

79. Johnson JC, Orbach MK. Perceiving the political landscape: ego biases in cognitive political networks. *Social Networks* 2002; 24: 291-310.
80. Krackhardt D. Assessing the political landscape: structure, cognition, and power in organizations. *Administrative Science Quarterly* 1990; 35(2): 342-369.
81. Wilbanks TJ. *How Geographic Scale Matters in Seeking Community Resilience.* Community and Regional Resilience Institute, Research Report 7, Oak Ridge, TN: Community and Regional Resilience Institute, 2009.
82. Cutter SL, Burton CG, Emrich CT. Disaster resilience indicators for benchmarking baseline conditions. *Journal of Homeland Security and Emergency Management* 2010; 7(1): 1-22.
83. Airriess CA, Li W, Leong KJ, et al. Church-based social capital, networks and geographical scale: Katrina evacuation, relocation, and recovery in a New Orleans Vietnamese American community. *Geoforum* 2008; 39(3): 1333-1346.
84. Li W, Airriess CA, Chen ACC, et al. Katrina and migration: evacuation and return by African Americans and Vietnamese Americans in an Eastern New Orleans suburb. *The Professional Geographer* 2010; 62(1): 103-118.
85. Cheong S-M. Community adaptation to the Hebei-Spirit oil spill. *Ecology and Society* 2012; 17(3): 26.
86. Dressler WW. Cultural consonance. In: D Bhugra, K Bhui (Eds). *Textbook of Cultural Psychiatry*. Cambridge, UK: Cambridge University Press, 2007, pp. 179-190.
87. Dressler WW. Cultural consonance: linking culture, the individual and health. *Preventive Medicine* 2012; 55(5): 390-398
88. Romney AK, Weller SC, Batchelder WH. Culture as consensus: a theory of culture and informant accuracy. *American Anthropologist* 1986; 88(2): 313-338.
89. Dressler WW. Culture and the risk of disease. *British Medical Bulletin*, 2004; 69: 21-31.
90. Pfefferbaum RL, Pfefferbaum B, Van Horn RL, et al. The Communities Advancing Resilience Toolkit (CART): an intervention to build community resilience to disasters. *Journal of Public Health Management Practice*, 2013; 19(3): 250-258.
91. Baum A, Fleming I. Implications of psychological research on stress and technological accidents. *American Psychologist* 1999; 48(6): 665-672.
92. Bremner JD, Vermetten E. Stress and development: behavioral and biological consequences. *Development and Psychopathology* 2001; 13(3), 473-489.
93. Federal Emergency Management Agency. *National Response Framework.* Available online from http://www.fema.gov/national-response-framework. Updated 2013. Accessed 13 June 2013.