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Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness

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Abstract Communities have the potential to function effectively and adapt successfully in the aftermath of disasters. Drawing upon literatures in several disciplines, we present a theory of resilience that encompasses contemporary understandings of stress, adaptation, wellness, and resource dynamics. Community resilience is a process linking a network of adaptive capacities (resources with dynamic attributes) to adaptation after a disturbance or adversity. Community adaptation is manifest in population wellness, defined as high and non-disparate levels of mental and behavioral health, functioning, and quality of life. Community resilience emerges from four primary sets of adaptive capacities—Economic Development, Social Capital, Information and Communication, and Community Competence—that together provide a strategy for disaster readiness. To build collective resilience, communities must reduce risk and resource inequities, engage local people in mitigation, create organizational linkages, boost and protect social supports, and plan for not having a plan, which requires flexibility, decision-making skills, and trusted sources of information that function in the face of unknowns.

Keywords Resilience · Community resilience · Disaster · Preparedness

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Resilience as a Metaphor

When applied to people and their environments, "resilience" is fundamentally a metaphor. With roots in the sciences of physics and mathematics, the term originally was used to describe the capacity of a material or system to return to equilibrium after a displacement. A resilient material, for example, bends and bounces back, rather than breaks, when stressed (Bodin and Wiman 2004; Gordon 1978). In physics, resilience is not a matter of how large the initial displacement is or even how severe the oscillations are but is more precisely the speed with which homeostasis is achieved. The image is a compelling one, capable of sparking human imagination, as it clearly did for Holling (1973) in his original and influential thesis about "ecological resilience." The concept of resilience has since been applied to describe the adaptive capacities of individuals (e.g., Bonanno 2004; Butler et al. 2007; Rutter 1993; Werner and Smith 1982), human communities (e.g., Brown and Kulig 1996/97; Sonn and Fisher 1998), and larger societies (e.g., Adger 2000; Godschalk 2003). As references to resilience have continued to increase, so too

have criticisms that the concept may be inappropriate, imprecise, or "glittery" (e.g., Bodin and Winman 2004; Carpenter et al. 2001; Cowen 2001; Klein et al. 2003). Looking back, one wonders if perhaps the social and psychological sciences should have created their own language, free from inherited meanings, but the term is probably here to stay. Its metaphorical origins notwithstanding, human resilience, we believe, must now be studied on its own terms without undue concern with how those meanings correspond to known physical properties or laws. We return to the question of the meaning and definitions of resilience and related concepts in the next section of this paper.

The concept of "community resilience" raises the same concerns as the concept of resilience per se, but is further complicated by variation in the meaning of community. Not always, but typically, a community is an entity that has geographic boundaries and shared fate. Communities are composed of built, natural, social, and economic environments that influence one another in complex ways. Past writings on community resilience have described everything from grass-roots groups and neighborhoods to complex amalgams of formal institutions and sectors in larger geo-political units. This is not inappropriate, as resilience can be understood and addressed at different levels of analysis. Discussions of community resilience often note that the "whole is more than the sum of its parts," meaning that a collection of resilient individuals does not guarantee a resilient community (e.g., Pfefferbaum et al. 2005; Rose 2004). As Brown and Kulig (1996/97, p. 43) observed, "People in communities are resilient together, not merely in similar ways."

The primary focus of this paper is community resilience as it applies to disasters. We adopted McFarlane and Norris' (2006, p. 4) definition of disaster as "a potentially traumatic event that is collectively experienced, has an acute onset, and is time delimited; disasters may be attributed to natural, technological, or human causes." This definition includes acts of nature, such as hurricanes, floods, and earthquakes; large industrial, transportation, and nuclear accidents; and episodes of mass violence, such as terrorist attacks and shooting sprees. It excludes chronic environmental hazards, ongoing community and political violence, war, and epidemics, not because they are less important but because the dynamics of how such stressors unfold over time are different enough to warrant boundaries of the potential applicability of theory and research. Still, much of what is known or proposed here about community resilience was gleaned from or applies equally well to other types of collective stressors and adversities.

Several other papers on this topic have appeared in recent years, and two pathways to the present state of knowledge are discernible. One path has been relatively more concerned with community resilience as it prevents disaster-related health or mental health problems of community members. The other path has been relatively more concerned with community resilience as it describes effective organizational behavior and disaster management. These two paths have sometimes, but not always, informed each other. Although our work primarily follows the first path, our goal was to integrate the various ways past writers have conceptualized (and occasionally researched) resilience and related terms. After all, postdisaster community health depends in part on the effectiveness of organizational responses, and ultimately the purpose of disaster management is to ensure the safety and well-being of the public. In addition to these two literatures on community resilience, we drew upon resilience literature in the fields of psychology, sociology, geography, anthropology, public health, ecology, technology, and communications[1] and upon past stress theory and disaster research. In this paper, we begin by discussing resilience as a *theory*. We present a model that integrates various conceptualizations and define each of the model's components. We next discuss community resilience as a *set of capacities* and review themes in past work that inform hypotheses about these capacities, such as social capital. We then discuss community resilience as a *strategy* for promoting effective disaster readiness and response. We conclude with several caveats or complexities that must be recognized and addressed in future resilience theory, research, and application.

[1] We used a wide array of search techniques in the literature review including controlled vocabulary (for example, in the PsycINFO database, using the term "resilience" which is included in the PsycINFO thesaurus) and free text searching (for example, using the term "community resilience," which is not a term in the PsycINFO thesaurus but would cue the database to identify papers with community resilience in their titles or abstracts). Because one of the goals of this project was to discover what had been written about community resilience and how resilience was already conceptualized in the literature, the initial search strategy was to cast as wide a net as possible. In this way, free text searches using the terms "resilience" and "community resilience" were conducted in a variety of databases (i.e., PsychINFO, PubMed, ERIC, PILOTS, Academic Search Premier) to capture as many articles as possible that used the term. As one might imagine, this broad search strategy yielded a diverse (an oftentimes irrelevant) combination of articles from disciplines as disparate as economics and food processing. The broad search illustrated, if nothing else, the popularity of the term and the infinite ways resilience is used to describe varying concepts across disciplines. Free text searches can also be helpful when the term is new and perhaps has not yet been added to a thesaurus. Since community resilience is a relatively new term, efforts were made to find articles that might discuss the spirit of community resilience without using the term community resilience. Examples of terms used to ferret out such papers (used individually and in combination) included: cohesion, adaptability, empowerment, mobilization, collective capacity, and collective healing. In a more disciplined and focused search, controlled vocabulary strategies were used to adhere to the search terms used by specifics databases.

Resilience as a Theory

Resilience has been defined in a variety of ways (see Table 1). Most definitions emphasize a capacity for successful adaptation in the face of disturbance, stress, or adversity. Although there are exceptions, most discussions, if not the definitions themselves, distinguish resilience from "resistance." In mathematics and technology, resistance refers to the force required to displace the system from equilibrium, whereas resilience refers to the time

Table 1 Representative definitions of resilience

Citation first author, year	Level of analysis	Definition
Gordon, 1978	Physical	The ability to store strain energy and deflect elastically under a load without breaking or being deformed
Bodin, 2004	Physical	The speed with which a system returns to equilibrium after displacement, irrespective of how many oscillations are required
Holling, 1973	Ecological system	The persistence of relationships within a system; a measure of the ability of systems to absorb changes of state variables, driving variables, and parameters, and still persist
Waller, 2001	Ecological system	Positive adaptation in response to adversity; it is not the absence of vulnerability, not an inherent characteristic, and not static
Klein, 2003	Ecological system	The ability of a system that has undergone stress to recover and return to its original state; more precisely (i) the amount of disturbance a system can absorb and still remain within the same state or domain of attraction and (ii) the degree to which the system is capable of self-organization (see also Carpenter et al. 2001)
Longstaff, 2005	Ecological system	The ability by an individual, group, or organization to continue its existence (or remain more or less stable) in the face of some sort of surprise….Resilience is found in systems that are highly adaptable (not locked into specific strategies) and have diverse resources
Resilience Alliance, 2006	Ecological system	The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and feedbacks—and therefore the same identity. (Retrieved 10/16/2006 from http://www.resalliance.org/564.php)
Adger, 2000	Social	The ability of communities to withstand external shocks to their social infrastructure
Bruneau, 2003	Social	The ability of social units to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future earthquakes
Godschalk, 2003	City	A sustainable network of physical systems and human communities, capable of managing extreme events; during disaster, both must be able to survive and function under extreme stress
Brown, 1996	Community	The ability to recover from or adjust easily to misfortune or sustained life stress
Sonn, 1998	Community	The process through which mediating structures (schools, peer groups, family) and activity settings moderate the impact of oppressive systems
Paton, 2000	Community	The capability to bounce back and to use physical and economic resources effectively to aid recovery following exposure to hazards
Ganor, 2003	Community	The ability of individuals and communities to deal with a state of continuous, long term stress; the ability to find unknown inner strengths and resources in order to cope effectively; the measure of adaptation and flexibility
Ahmed, 2004	Community	The development of material, physical, socio-political, socio-cultural, and psychological resources that promote safety of residents and buffer adversity
Kimhi, 2004	Community	Individuals' sense of the ability of their own community to deal successfully with the ongoing political violence
Coles, 2004	Community	A community's capacities, skills, and knowledge that allow it to participate fully in recovery from disasters
Pfefferbaum, 2005	Community	The ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene, and move on
Masten, 1990	Individual	The process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances
Egeland, 1993	Individual	The capacity for successful adaptation, positive functioning, or competence…despite high-risk status, chronic stress, or following prolonged or severe trauma
Butler, 2007	Individual	Good adaptation under extenuating circumstances; a recovery trajectory that returns to baseline functioning following a challenge

Note. Because of our focus, definitions of community resilience are presented here in disproportionate frequency. Definitions describing larger (ecological) and smaller (individual) levels of analysis were representative of others in the literature

required for the system to return to equilibrium once displaced (Bodin and Wiman 2004). Across these definitions, there is general consensus on two important points: first, resilience is better conceptualized as an ability or process than as an outcome (Brown and Kulig 1996/97; Pfefferbaum et al. 2005); and second, resilience is better conceptualized as adaptability than as stability (e.g., Handmer and Dovers 1996; Waller 2001). In fact, in some circumstances, stability (or failure to change) could point to lack of resilience. The resilience of systems, for example, depends upon one component of the system being able to change or adapt in response to changes in other components; and thus the system would fail to function if that component remained stable (Adger 2000; Klein et al. 2003). Adaptability also takes different forms. "Engineering resilience" makes a system return to one pre-designed state or function after a disturbance, whereas "ecological resilience" allows for many possible desirable states that match the environment (Gunderson 2000). The second type of resilience is probably the relevant one for human communities, organizations, and societies.

With these past definitions in mind, we define resilience as: *a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance*. Adaptive capacities are resources with dynamic attributes, a point to which we will return momentarily. The specific elements of the definition would be operationalized differently depending upon the level of analysis, be it an individual, grass-roots group, larger human community, or entire ecology, but our basic definition aims to apply across levels. In our definition, we carefully did not equate resilience with the outcome, but rather with the process linking resources (adaptive capacities) to outcomes (adaptation).

Figure 1 introduces a variety of concepts that we elaborate upon in the discussion to follow. Table 2 provides a summary of definitions of key terms in the model. Although the notion of positive trajectories occurs in recent writings (Butler et al. 2007), our model of resilience owes its fundamental structure to Dohrenwend's (1978) model of psychosocial stress, presented as part of her presidential address to Division 27 (Community Psychology) of the American Psychological Association. Our model has been updated, however, to encompass contemporary theories of stress, to use the nomenclature common in discussions of resilience, and to apply across multiple levels of analysis (e.g., persistent dysfunction has replaced psychopathology as the adverse outcome).

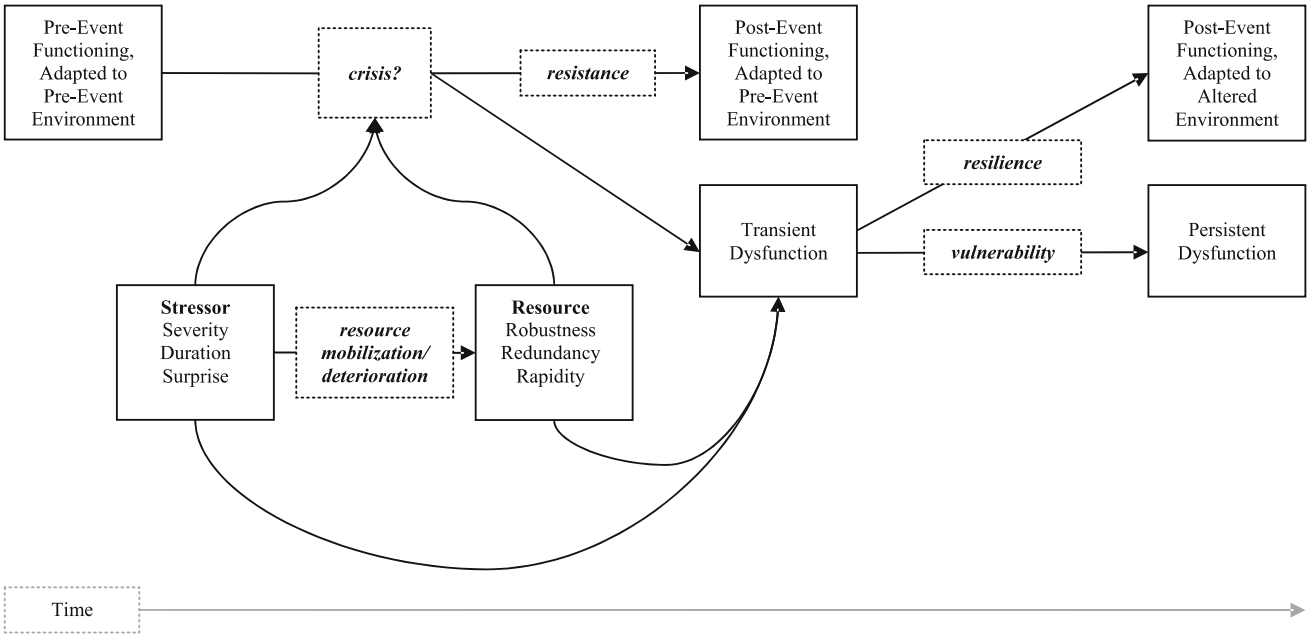

Fig. 1 Model of stress resistance and resilience over time: Resistance occurs when resources are sufficiently robust, redundant, or rapid to buffer or counteract the immediate effects of the stressor such that no dysfunction occurs. Total resistance is hypothesized to be rare in the case of severe, enduring, or highly surprising events, making transient situational dysfunction the more likely and normative result in the immediate aftermath of disasters. Resilience occurs when resources are sufficiently robust, redundant, or rapid to buffer or counteract the effects of the stressor such that a return to functioning, adapted to the altered environment, occurs. For human individuals and communities, this adaptation is manifest in wellness. Vulnerability occurs when resources were not sufficiently robust, redundant, or rapid to create resistance or resilience, resulting in persistent dysfunction. The more severe, enduring, and surprising the stressor, the stronger the resources must be to create resistance or resilience

Table 2 Key terms in the theoretical model

Concept	Definition
Resilience	A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance
Community resilience	A process linking a set of networked adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance
Resilient (adj.)	Having shown, currently showing, or eventually showing a positive trajectory of functioning and adaptation after an initial disturbance as a result of adequate adaptive capacities
Adaptive capacities	Resources with dynamic attributes, i.e., resources that are robust, redundant, or rapidly accessible
Resources	Objects, conditions, characteristics, and energies that people value
Robustness	One of three dynamic attributes of resources; resource strength, in combination with a low probability of resource deterioration
Redundancy	One of three dynamic attributes of resources; the extent to which elements are substitutable in the event of disruption or degradation
Rapidity	One of three dynamic attributes of resources; how quickly the resource can be accessed and used (mobilized)
Resilience-resources	Synonymous with adaptive capacities
Resilience-outcomes	The end result of resilience, characterized here as wellness for individuals and populations
Psychological wellness	An individual-level outcome indicative of successful adaptation defined according to four criteria: (1) absence of stress-related psychological disorders; (2) healthy patterns of behavior; (3) adequate role functioning at home, school, and/or work; and (4) high quality of life
Population wellness	A community-level outcome indicative of successful adaptation, defined as high and non-disparate levels of mental and behavioral health, role functioning, and quality of life in constituent populations
Quality of life	One component of wellness that captures how people generally feel about their lives as a whole and in domains of work or school, family, health, leisure, and neighborhood.

Stress and Stress Resistance

Our model begins when a stressor, such as a disaster, occurs. Stressors are aversive circumstances that threaten the well-being or functioning of the individual, organization, neighborhood, community, or society. Models of the stress process typically consider (a) characteristics of the stressor, (b) appraisals of the stressor, (c) the response to or effects of the stressor, and (d) various conditions that influence the relations between the stressor, stress appraisal, and stress response. In stress-diathesis theory, level of exposure is proposed to interact with pre-existing vulnerabilities to influence the stress response. The influence of this theory is evident in some of the earliest published frameworks for disaster research (see Benight et al. 2006, for further discussion of these points).

Stressors vary on a number of dimensions. Important dimensions for characterizing disasters include severity, duration, and surprise. Severity of exposure is a consistent risk factor for adverse psychosocial consequences in the aftermath of disasters (Norris et al. 2002a, b). Specific stressors that have been found to affect postdisaster mental health include bereavement, injury to self or family member, life threat, property damage, financial loss, community destruction, and displacement. Disasters are stressful not only for individuals experiencing personal loss but also for the community-at-large (e.g., Norris et al. 1994). Communities share damages and disruptions to the various environments of which they are composed. Destruction of a "keystone" neighborhood, such as a central business district, may challenge an entire city or region (Fullilove and Saul 2006). And, in extreme cases, such as the September 11th terrorist attacks, the stress may be felt by an the entire nation (Silver et al. 2002).

Although disasters are rarely anticipated for more than a few days in advance, if at all, they vary in duration of environmental disruption. For example, after Hurricane Katrina in August 2005, the most badly affected neighborhoods in New Orleans remained uninhabitable for years after the levee breech. The stressors were of long duration even though the floodwaters receded within weeks. Certain technological disasters may initiate long periods of threat related to contamination; they essentially evolve into chronic hazards, such as happened in the case of the Chernobyl nuclear disaster (Bromet et al. 2000).

Longstaff (2005) provided a particularly thought-provoking treatment of the nature of the stressors confronted by systems and communities. She heavily emphasized the unpredictable nature of the dangers confronting contemporary planners. Our world is increasingly interconnected and complex, with systems in constant flux in reaction to changes in other systems, making surprise more common than predictability. Some dangers are familiar but unpredictable as to where or when they will happen (known

unknowns), but some dangers are new: "We don't know about and won't know about these until they happen" (unknown unknowns). Longstaff used the concept of "surprise" to capture this discrepancy between what is expected and what is experienced. These surprises are nearly impossible to predict or prepare for, and thus call for broad resilience strategies (Allenby and Fink 2005).

The "crisis" in Fig. 1 symbolizes a hypothetical balancing act between stressors and resources. Do demands outweigh resources? The implied interaction has a long history in resilience theory (Rutter 1987) and is extremely important in disaster theory. In fact, Quarantelli (1986) defined disaster as a consensus-type crisis occasion where demands exceed capabilities. Quarantelli sought to remind us that the consequences of disasters follow not only from the needs of the community but from the community's capacity to meet those needs. Longstaff (2005, p. 16) described a crisis as "what happens when a surprise reveals a failure of the rules, norms, behavior or infrastructure used to handle that type of surprise." It has become almost a cliché to note that crises bring opportunities for growth as well as risk for harm, as this idea has been with us for a long time (Caplan 1964).

The ideal outcome after the crisis is resistance, meaning that the resources have effectively blocked the stressor and, accordingly, there is virtually no dysfunction, no mater how temporary. Individuals benefit from resistance strategies on a daily basis, in that the human immune system is one of the most effective resistance strategies known to exist. Resistance strategies are appropriate for dangers that are likely to happen with some frequency and can be planned for, such as fires, but they are not likely to be fully effective against surprises (Longstaff 2005). Nonetheless, there are critical systems that aspire for resistance in the aftermath of disaster. Earthquake- and fire-resistant buildings, redundant power sources, and terrorist surveillance and detection systems are but a few examples of actions that help communities to prevent or resist disaster.

Resilience and Adaptation

Resistance is an unlikely course for individuals and communities (and actually even for emergency systems) in the aftermath of disasters, which brings us to the notion of transient dysfunction, similar to Dohrenwend's (1978) concept of the transient stress reaction (see Fig. 1). Disaster research indicates that the most typical pattern is for distress to be nearly universal in the first weeks or months postdisaster, even though only a minority of participants experience criterion-level psychopathology (Norris et al. 2002a, b). Most longitudinal disaster studies find that an event's adverse effects dissipate over time, leaving only a minority of communities and a minority of individuals within those communities chronically impaired. Most of the time—especially if the severity of the stressor has lessened and resources have been replenished—transient dysfunction is followed by a return to predisaster levels of functioning.

The process that produces adapted outcomes is resilience; the more rapid the return to pre-event functioning, the greater the resilience. In his influential paper on psychological resilience, Bonanno (2004) differentiated between recovery and resilience trajectories. The former he characterized as involving a period of dysfunction lasting several months or more, followed by a gradual return to pre-event functioning. A trajectory of resilience, on the other hand, may involve transient perturbations, lasting as long as several weeks, but it generally involves a stable trajectory of healthy functioning. Most research does not clearly distinguish between these two trajectories.

Our primary point here is that resilience does not preclude dysfunction or distress. It is now commonly accepted in the disaster field that some distress is a normal reaction to an abnormal event (e.g., Flynn 1994). However, the dysfunction or distress is transient, followed by a return to functioning. Postevent functioning may not be the qualitative equivalent of pre-event functioning when there is a need to adapt to an altered environment. The phrase "new normal" was heard often in the aftermath of the September 11th terrorist attacks, as people speculated on America's capacity to adapt to the ongoing threat of terrorism and the demands and inconveniences of heightened security (Redlener and Morse 2006). We do not characterize this adaptive trajectory as "growth," although others might legitimately dispute this choice (Brown and Kulig 1996/97; Linley and Joseph 2005). Adapted functioning is not necessarily superior in level or character or effectiveness to pre-event functioning; it is simply different.

The alternative outcome to renewed and adapted functioning is persistent dysfunction. It results from "vulnerability," defined roughly as the antonym of stress resistance or resilience. We say little about vulnerability in this paper, but it has been and should remain an important concept in hazard management (e.g., Cutter et al. 2003, 2006).

Wellness as the Manifestation of Adaptation

What is the end result of this process? Adaptation is the theoretical result, but how is it manifest? This has been debated. In the mental health arena, for example, researchers have proposed that the appropriate individual outcome is minimal impairment of functioning despite distress, rapid recovery from distress, no distress at all, and

adversarial growth (Bonanno 2005; Linley and Joseph 2005; Litz 2005). In practice, resilience often has been operationalized as the absence of psychopathology, which is highly inadequate (Rutter 1993). A strict focus on prevalence of disorders may cause us to erroneously or prematurely conclude that a community has recovered from the event when there is still considerable distress, dysfunction, or dissatisfaction present, and it dismisses the adverse consequences of suffering that does not qualify for strict definitions of pathology. Here, we first discuss individual resilience-outcomes and then turn our attention to community resilience-outcomes.

Psychological Wellness

We suggest that "wellness" is a viable indicator that adaptation has occurred on the individual level. We base this conclusion largely on the writings of Cowen (1983, 1994, 2000), who contended that psychological wellness provides a broad and integrative frame for psychological questions and activities, including those related to primary prevention, empowerment, and resilience. By arguing that "wellness must be a matter of prime concern at all times, not just when it fails," Cowen (2000, p. 80) aimed to move psychology beyond a focus on repairing dysfunction (including efforts to increase the reach of services) to a prime focus on promoting wellness. According to Cowen, one advantage of this emphasis on wellness, as opposed to some competing frames, was that it retained continuity with the traditions and past developments in the field of mental health. This is cogent advice for applying our work to disaster readiness and recovery: a connection to wellness places community resilience solidly within the domains of concern for local, state, and federal policy-makers charged with protecting health and behavioral health in the aftermath of major disasters and terrorist attacks.

As a manifestation of adaptation, we define psychological wellness according to four criteria: (1) absence of psychopathology; (2) healthy patterns of behavior; (3) adequate role functioning at home, school, and/or work; and (4) high quality of life. Quality of life captures how people generally feel about their lives as a whole and in domains of work, family life, health, leisure, and neighborhood (e.g., Zautra and Bachrach 2000). Our definition of wellness is not identical to Cowen's (2000, p. 83) but consistent with it, as well as with areas of concern for public health and behavioral health policies and programs. A criterion of wellness serves to remind us that we must attend to disaster victims' abundant problems in living that may interfere with their quality of life (Norris et al. 2002a, b).

Importantly, this definition retains the criterion of being free of psychological disorder even though wellness is more than this. Stress-related disorders remain a relevant area for postdisaster research and intervention. It would be unfortunate if a focus on resilience and wellness caused us to neglect those persons who fare most poorly in disasters. A growing body of research shows that posttraumatic stress disorder, major depressive disorder, and other mental illnesses strongly and adversely influence functioning and quality of life (Kessler 2000; Thorp and Stein 2005). Mental health, healthy behavior, adequate functioning, and quality of life are interrelated but conceptually distinct. Wellness might actually be a "higher bar" than has been used in resilience research, but it is an appropriate standard for concluding that adaptation to an altered environment has occurred. As Cowen (2000) also noted, wellness is a continuum. Individuals (and communities) show varying degrees of wellness before as well as after disasters, and this context must be taken into account in assessing post-disaster adaptation.

Population Wellness

But what about community resilience? By what standard do we conclude that a community has adapted? Although we recognize that a community is not merely the sum total (or average) of its members, we recommend that community-level adaptation be understood as "population wellness," a high prevalence of wellness in the community, defined as high and non-disparate levels of mental and behavioral health, role functioning, and quality of life in constituent populations. There are three reasons for this choice: first, although emergency management systems are not directly responsible for health, if they function effectively to protect lives, reduce injuries, minimize damage to public utilities, and connect community members to necessary services, it is reasonable to expect the population to remain well. Wellness is one criterion that should apply in most circumstances. Second, wellness levels in the community can be monitored in postdisaster needs assessment and surveillance initiatives to guide resource allocation (Galea and Norris 2006). Third, this definition keeps the outcome conceptually distinct from the community resources that promote resilience (and wellness, in turn).

Although much of the research on disasters has focused on individual-level outcomes (Norris et al. 2002a, b), effects can be observed at the community or population level (Galea and Resnick 2005). In a prospective study of a flood in eastern Kentucky (Appalachia), Norris et al. (1994) differentiated between primary victims (those with personal losses), secondary victims (others living in the flooded counties), and non-victims (persons living in neighboring, non-flooded counties). They documented community-wide tendencies for residents to feel less positive about their

social networks and surroundings, less enthusiastic and energetic, and less able to enjoy life after the flood. No one would suggest that such consequences constitute psychopathology, but they do indicate that disasters sometimes impair the quality of life in the community for quite some time. It is important to note that population wellness is not captured fully by *average* behavioral health or quality of life. Abnormal *variability* might be of greater concern, suggesting that disparities in mental and behavioral health within the population have been created or exacerbated by the disaster or stressor (Galea et al. 2005).

Determinants of population wellness cannot be identified in studies of individuals within a single population. This may sound blatantly obvious, but many examples to the contrary exist in the literature, compelling us to underscore this point. Within a population, the distribution of illness is determined by individual susceptibility. Rose (2001) shared several excellent examples from public health research. One example concerned blood pressure in Kenya and London. In both populations, blood pressure varies. Through traditional risk factor research, we could determine why some Kenyans have higher blood pressure than others and why some Londoners have higher blood pressure than others, but we would fail to observe that the London setting shifted the entire distribution upward. Thus to find the determinants of prevalence and incidence rates we need to study characteristics of populations rather than the characteristics of individuals.

These two approaches to etiology (individual and population) have their counterparts in prevention. The population strategy attempts to control mean level of risk factors, to shift the whole distribution in a favorable direction. This shift may bring much benefit to the population by reducing the incidence or prevalence of a problem, but it offers only a small benefit to each individual. This is the "prevention paradox" (Rose 1981). Effects that seem small in analyses of individuals may be quite large when extrapolated to entire populations.

Dynamic Attributes of Resilience-Resources

What determines which process (and consequent outcome) occurs? We believe this depends on a host of objects, conditions, characteristics, and energies that people value—that is, resources (Hobfoll 1988, 2006). Later, we review the specific resources that have been shown or theorized to influence community resilience but here our primary goal is to identify the attributes of resources that make them available and accessible for buffering or counteracting stress.

We found the discussion of Bruneau et al. (2003) especially enlightening for thinking about the dynamic attributes that resources must have to engender resilience. Bruneau et al. theorized that resilient systems have four key properties. With unusual specificity for discussions of resilience, Bruneau and colleagues provided numerous examples of how their four properties could be operationalized for monitoring the performance of the technical, organizational, social, and economic systems that compose a community.

"Robustness" is the ability to withstand stress without suffering degradation. A resistance strategy is robust if it keeps out or counteracts a wide variety of dangers, but it is fragile if it works only under a small number of possible scenarios (Longstaff 2005). Because of the importance of resource loss in stress theory (more discussion to follow), we characterize robustness as resource strength, in combination with a low probability of resource deterioration.

"Redundancy" is the extent to which elements are substitutable in the event of disruption or degradation. Many technological systems (airplanes, power grids) have extensive redundancy built into them. People build in redundancy too by having larger social networks or by having more than one way to solve a problem or even by having more than one lung or kidney. A condition related to redundancy is "resource diversity." Communities that are dependent on a narrow range of resources are less able to cope with change that involves the depletion of that resource, a state that is sometimes referred to as "resource dependency" (Adger 2000). For example, some ecologists (Adger 2000; Klein et al. 2003) have argued that coastal economies are more resilient than inland economies because they have many different functions, linkages, and niches. Resource dependency is somewhat the opposite of redundancy.

The remaining two properties in Bruneau et al.'s scheme were "rapidity," the capacity to achieve goals in a timely manner to contain losses and avoid disruption, and "resourcefulness," the capacity to identify problems and mobilize resources when conditions threaten the system. The "4Rs" almost work for our purposes (i.e., as attributes of resources rather than as properties of systems) but not quite. Resourcefulness as a property of resources is semantically problematic, and we view critical thinking as a specific resource, rather than as a dynamic attribute that resources share. Thus, we revised this framework slightly by incorporating mobilization into rapidity, redefined to reflect how quickly the resource can be accessed and used.

Thus, in summary, we propose that resilience-resources have three dynamic properties: robustness, redundancy, and rapidity. We speculate that a resource need have only one of these attributes to engender resilience, but this is an empirical question. In a case study of the Emergency Operations Center (EOC) after the 2001 World Trade Center Disaster, Kendra and Wachtendork (2003) showed

how the EOC's ability to rapidly access other resources substituted for lack of redundancy of personnel, equipment, and space when the EOC was destroyed in the attack.

Resource Mobilization and Deterioration

Resilience can fail when resilience-resources are themselves damaged or disrupted by the stressor. Kimhi and Shamai (2004) examined perceptions of community resilience across four communities that varied in their proximity to the Israel–Lebanon border and thus varied with respect to threat of political violence. Individuals living in the community that had experienced the highest level of threat for the longest period of time perceived their community as less resilient than did individuals in the other communities. If these perceptions are accurate, this example suggests that the community's abilities to cope with the threat were themselves harmed by the threat and thus illustrates the importance of robustness as an essential quality of resilience-resources, as discussed above. Disasters and other stressors cause both resource mobilization and resource deterioration. Ideally, the emergent resources are sufficient to protect or replenish the vulnerable resources, but this not always the case.

The concept of resource loss has become central in stress theory, primarily because of the influence of Hobfoll's (1988, 1998, 2006) theory of "conservation of resources" (COR). The basic tenet of COR theory is that "individuals strive to obtain, retain, protect, and foster those things that they value," which are termed resources (Hobfoll 2006, p. 217). In Hobfoll's theory, stress occurs when resources are threatened, when resources are lost, or when individuals fail to gain resources following a significant investment of other resources. In COR theory, people must invest resources in order to protect against resource loss, recover from losses, and gain resources; this serves to make those with greater resources less vulnerable to resource loss and more capable of resource gain (the rich get richer, so to speak).

COR theory has become highly influential in disaster research because disasters and terrorism threaten a host of object resources (housing), personal resources (e.g., optimism, safety), social resources (companionship), and energies (money, free time). This phenomenon wherein resources are themselves harmed by the stressors they are presumed to buffer severely limits the protection resources can afford. Scored simply as a count of losses tallied from an inventory, resource loss has correlated highly with symptom severity in several disaster studies (Norris et al. 2002b).

Recognition that the loss of resources is *shared* by members of a highly traumatized community was most eloquently described by Erikson (1976), in his ethnography of the Buffalo Creek, West Virginia dam collapse that caused heavy loss of life and massive displacement in a small mining town. Loss of social connections was severe, leaving survivors feeling isolated and alone (see also Abramowitz 2005). Some years later, Kaniasty and Norris (1993) proposed and validated a more specific "social support deterioration model," which posited that the impact of disasters on mental health is both direct and indirect, through disruptions of social networks and declines in perceptions of support availability. Loss of social supports may be especially severe and long-lasting in the context of displacement, especially for women (Norris et al. 2005a). Many things can lead to postdisaster declines in social support, including not only severe stressors, such as displacement and death of significant others, but also loss of routine opportunities for companionship and leisure, community conflicts about the causes of the disaster and appropriate responses, and violated expectations of aid (Edelstein and Wandersman 1987; Kaniasty and Norris 2004; Tobin and Whiteford 2002).

Fortunately we can say that postdisaster deterioration of social resources is not inevitable. Using longitudinal data collected after Hurricanes Hugo (1989) and Andrew (1992), Norris and Kaniasty (1996) proposed and validated a model of "social support deterioration deterrence" in which the positive relation between severity of exposure and received support (resource mobilization) to a greater or lesser extent offset or counteracted the negative relation between severity of exposure and perceived support (resource deterioration). Victims who received high levels of help following the disasters were thus protected against salient erosion in their perceptions of belonging and expectations of support.

Resilience as a Set of Capacities

In our framework, resilience emerges from a set of adaptive capacities—*community* resilience from a set of *networked* adaptive capacities. This is an important point: resilience rests on both the resources themselves and the dynamic attributes of those resources (robustness, redundancy, rapidity); we use the term "adaptive capacities" to capture this combination. This view is generally consistent with Gunderson's (2000) definition of adaptive capacity as the property of the ecosystem that describes changes in stability landscapes and resilience. Its transformational characteristics are what distinguish "community resilience" from other ways of characterizing community strengths, such as "community competence" or "social capital" (Brown and Kulig 1996/97; Pfefferbaum et al. 2005), both of which are viewed as resources, more properly as sets of resources,

here. However, our definition comes very close to the meaning of "community capacity," a term that has been used for some years in public health, usually as it relates to the implementation of a public health program or practice. Goodman et al. (1998, p. 259) defined community capacity in two ways: "(1) the characteristics of communities that affect their ability to identify, mobilize, and address social and public health problems and (2) the cultivation and use of transferable knowledge, skills, systems, and resources that affect community- and individual-level changes consistent with public health-related goals and objectives." We might say that capacities become adaptive capacities when they are robust, redundant, or rapidly accessible and thus able to offset a new stressor, danger, or surprise. Goodman et al. identified several dimensions of community capacity. We include most of their dimensions within the sets described subsequently.

On the basis of our review of the literature, we identified four primary sets of networked resources: Economic Development, Social Capital, Information and Communication, and Community Competence (see Fig. 2). These sets are far from orthogonal, but they are also far from synonymous. Much has been written about these concepts that are introduced here only briefly. Our purpose was not to provide a comprehensive, nuanced summary of what is known about each capacity but rather to draw conclusions about the set of capacities that should become the focus of our attention in community resilience theory, research, and application.

Economic Development

Resource Volume and Diversity

Communities are subject to larger sociological and economic forces. Adger (2000) developed a set of key parameters for observing "social resilience" (see Table 1). The first parameter encompassed economic growth, stability of livelihoods, and equitable distribution of income and assets within populations. Land and raw materials, physical capital, accessible housing, health services, schools, and employment opportunities create the essential resource base of a resilient community (Godschalk 2003; Pfefferbaum et al. 2005). Because of extensive interdependencies at the macroeconomic level, economic resilience depends not only on the capacities of individual businesses but on the capacities of all the entities that depend on them and on which they depend (Rose 2004, 2005).

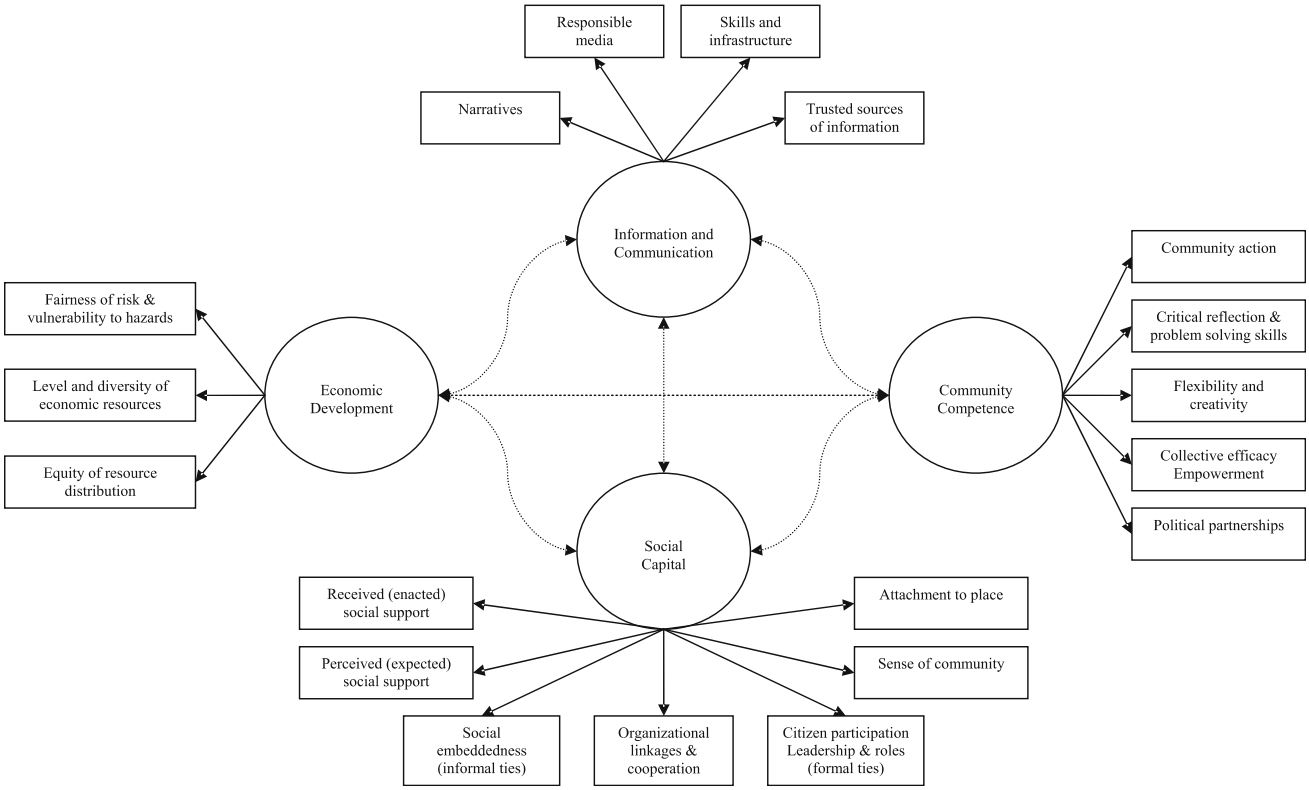

Fig. 2 Community resilience as a set of networked adaptive capacities

The case for a link between economic resources and postdisaster wellness is most evident in research on social class as a buffer of disaster stress. Past disaster research has shown that participants of lower socio-economic status (SES) often experience more adverse psychological consequences than do participants of higher SES (Norris et al. 2002a, b). Recent evidence (Ahern and Galea 2006) suggests that the adverse psychosocial effects of low income (an individual-level variable) after disasters are especially strong in the context of income inequities (a neighborhood-level variable). By taking a global perspective, we can make this case all the more strongly because previous research suggests that natural disasters are especially likely to engender severe psychological distress when they occur in the developing world. In fact, disaster location (United States, other developed country, developing country) was a stronger predictor of sample-level effects than either disaster type (mass violence, natural, technological) or sample type (child, adult, rescue/recovery) in Norris et al.'s (2002a, b) empirical review.

Community resilience depends not only on the volume of economic resources but also on their diversity. Using mangrove agriculture in Southeast Asia as an example, Adger (2000) showed how dependency on a narrow range of natural resources can increase variance in income and decrease social resilience. Extreme events, such as droughts, floods, or infestations, increase the risk of being dependent on particular resources and therefore decrease resilience. Cutter et al. (2006) described one community that was especially devastated by Hurricane Katrina in August 2005 because residents were almost totally reliant on the shrimping industry, on which the storm's impact was tremendous.

Resource Equity and Social Vulnerability

Societies do not allocate environmental risk equally, often making the poorest communities the weakest links in hazard mitigation (Cutter et al. 2003; Godschalk 2003; Tobin and Whiteford 2002). Differential risk is all the more striking from a global perspective because disasters are disproportionately likely to strike economically developing or poor countries (De Girolamo and McFarlane 1996). Wisner (2001) argued that mitigation plans in developing countries often fail to address the "root causes of disaster vulnerability, namely, the economic and political marginality of much of the population and environmental degradation (pp. 251)." Quarantelli (1994) argued compellingly that increasing industrialization, expanding urbanization, and decaying infrastructures will lead to an escalation in the numbers of disasters worldwide and that developing countries will bear the brunt of this trend. In developing countries, housing quality is poor relative to that found in developed countries, so houses are less capable of withstanding severe force. Lacking means for obtaining other property, families often invade flood plains and other undesirable locations. Loss of life often numbers in the thousands or tens of thousands when major hurricanes or earthquakes strike poor countries. The southeast Asian tsunami of December 26, 2004 caused an unfathomable 276,000 deaths, according to a U.S. Geological Survey (retrieved October 21, 2006 from http://www.msnbc.msn.com/id/6948775).

Poor communities not only are at greater risk for death and severe damage, but they often are less successful in mobilizing support after disasters. In fact, disaster-stricken communities are not ruled in the most egalitarian way (Bolin and Bolton 1986; Beggs and Haines 1996; Kaniasty and Norris 1995; Tobin and Whiteford 2002). Ideally, the distribution or mobilization of support follows the "rule of relative needs." Simply put, the most support goes to those who need it the most. Often, however, the distribution of support follows the "rule of relative advantage" because one's embeddedness in the community, political connections, and social class determine the availability and accessibility of resources (Kaniasty and Norris 1995, 2004). While these rules typically describe the distribution of postdisaster support *within* communities, they also describe the distribution of support *across* communities (Norris et al. 2001). The capacity to distribute postdisaster resources to those who most need them seems vitally important for community resilience.

Social Capital

For developing a theory of community resilience, a highly relevant theme is social capital. Like resilience, social capital is a concept transferred from one discipline (in this case, economics) to another (Bourdieu 1985). Also like resilience, a variety of definitions and criticisms of those definitions have appeared, which Kadushin (2004) nicely summarized in his review of the concept. The basic idea of social capital is that individuals invest, access, and use resources embedded in social networks to gain returns (Lin 2001). It can also be defined as the aggregate of the actual or potential resources that are linked to possession of a durable network of relationships (Bourdieu 1985). Social capital theorists debate the roles of self-interest and status attainment and whether social capital should be conceived as an individual, collective, or multi-level asset (Wellman and Frank 2001). Theorists have also debated the extent to which people actively aim to increase their social capital (through investment) or whether, conversely, it arises from structural positions, families, and friendships (Kadushin 2004).

Network Structures and Linkages

Quite a bit has been written about network structures, which we group here under the umbrella of social capital. One dimension of community capacity, according to Goodman et al. (1998), is the presence of inter-organizational networks that are characterized by reciprocal links, frequent supportive interactions, overlap with other networks, the ability to form new associations, and cooperative decision-making processes. Comfort (2005) noted that uncertainty often leads to efforts to broaden the "scope of actors, agents, and knowledge that can be marshaled" (p. 347). More generally, this trend necessitates networked as opposed to hierarchical systems for disaster response. Longstaff (2005) highlighted the importance of "keystones" or "hubs,"—"super-connected" network members who link one network to another (see also Fullilove and Saul 2006). Despite the many values of dense networks, they are also more complex and therefore more uncertain. The efficiency of hubs may actually decrease resilience because if the hub is compromised, the entire system fails (Allenby and Fink 2005). Frequent flyers can probably appreciate this point. Systems will be highly vulnerable if there is little redundancy for these connective functions.

Longstaff also noted the tendency to want individuals, groups, and organizations to come together tightly to resist danger. "Tight coupling" occurs when change in one component engenders a response from other components. This is not always bad, but tight coupling can also increase danger in some circumstances and can lead to premature convergence on solutions. "Loosely coupled" systems may be better at responding to local changes since any change they make does not require the whole system to respond (Longstaff 2005).

The happy medium may be loosely coupled organizations (to better respond to local needs) that are able to coordinate or collaborate (to facilitate access to their resources). Gillespie and Murty (1994) noted that the failure of relief organizations to work together results in "cracks" in the postdisaster service delivery network, whereas an effective service delivery system provides a complete set of services and linkages in which such cracks do not appear. Gillespie and Murty distinguished between two types of linkage cracks: "Isolates" are organizations with essential services that do not interact with the rest of the network. They impair service delivery because their services are inaccessible to potential consumers who enter the network elsewhere. "Peripherals" are organizations that are connected to the network only by means of a long and indirect series of links. They create inefficiency as a great deal of time and effort may be required to access the services they provide, and they are at risk of becoming isolates if any one link is impaired. Gillespie and Murty studied a disaster response network in a Midwestern setting and identified both isolates and peripherals among the organizations that had capacities and experience that were essential for the functioning of the network as a whole.

Social Support

Social support refers to social interactions that provide individuals with actual assistance and embed them into a web of social relationships perceived to be loving, caring, and readily available in times of need (Barrera 1986). Research on social support (see Kaniasty and Norris 2004) has long distinguished between "received support" (actual receipt of help) and "perceived support" (the belief that help would be available if needed). Social support, whether received (enacted) or perceived (expected), varies on two critical dimensions (Kaniasty and Norris 2000). The first dimension, source, is reflected in the overall pattern of help utilization. This pattern resembles a pyramid with its broad foundation being the family, followed by other primary support groups, such as friends, neighbors, and co-workers, followed by formal agencies and other persons outside of the victim's immediate circle. The second dimension, type, differentiates between emotional, informational, and tangible support.

Received support typically shows a mobilization pattern by increasing in the aftermath of disasters and correlating positively with severity of exposure. It protects against erosion of perceived support, which in turn is a powerful protective factor for mental health (Norris and Kaniasty 1996). Received support is most helpful when it is reciprocal, meaning that there is a balance between receiving and providing support (Hogan et al. 2002; Maton 1988; Rook 1992). Being constantly on the receiving end of support exchanges can threaten self-esteem (Dunkell-Schetter and Bennett 1990), whereas being constantly on the providing end creates stress and burden (Solomon et al. 1993).

Another critical function of social support is social influence. In emergencies, people look to similar others to help them make decisions about appropriate behaviors. This idea, often characterized as "emergent norms," is among the oldest to be found in the sociology of disasters (Fritz and Williams 1957). For example, the greater one's social ties, the more likely one is to receive information about recommendations to evacuate. Evacuation is often the only available strategy to save lives and reduce personal injuries. In an analysis of evacuation decisions before Hurricanes Hugo and Andrew, Riad et al. (1999) found that residents with stronger social support were twice as likely to evacuate as were residents with weaker social support.

The important dimension was perceived support (e.g., ability to borrow money, get a ride, have a place to stay), not merely the number of ties.

Previous discussions have likewise emphasized the importance of social support for community resilience. One of Pfefferbaum et al.'s (2005) factors of community resilience was Support and Nurturance, referring to the community's care about the needs and well-being of members. Tse and Liew (2004) and Ganor and Ben-Lavy (2003) emphasized self-help and mutual support ("cohesion") as components. Goodman et al. (1998) similarly proposed that social relationships, including both the frequency and intensity of interactions (social embeddedness) and the benefits members receive from their social ties (received and perceived support), were dimensions of community capacity.

Community Bonds, Roots, and Commitments

For the most part, social support captures helping behaviors within family and friendship networks, but social capital also encompasses relationships between individuals and their larger neighborhoods and communities (Perkins et al. 2002; Perkins and Long 2002; Saegert and Winkel 2004). Three key social psychological dimensions of social capital are thus sense of community, place attachment, and citizen participation.

"Sense of community" is an attitude of bonding (trust and belonging) with other members of one's group or locale (Perkins et al. 2002, p. 37), including mutual concerns and shared values. Sense of community, characterized by high concern for community issues, respect for and service to others, sense of connection, and needs fulfillment, is assumed to be a dimension of community capacity (Goodman et al. 1998, p. 261). It is also believed to be an attribute of resilient communities (Ahmed et al. 2004; Landau and Saul 2004; Pfefferbaum et al. 2005; Tse and Liew 2004). As noted earlier, disasters often disrupt sense of community (e.g., Abramowitz 2005; Erikson 1976; Kaniasty and Norris 2004). However, in some circumstances, environmental threats can enhance survivors' sense of similarly and interdependence, leading to increased sense of community (Edelstein 1988).

"Place attachment" is closely related to one's sense of community (Tartaglia 2006). It implies an emotional connection to one's neighborhood or city, somewhat apart from connections to the specific people who live there (Altman and Low 1992; Manzo and Perkins 2006). Brown and Perkins (1992) argued that place attachments are integral to self-definitions; these attachments are holistic and multi-faceted and provide stability. Place attachment often underlies citizens' efforts to revitalize a community (Perkins et al. 2002) and thus may be essential for community resilience.

Place attachment may be of special note for disaster recovery, as these events have spatial parameters and harm built and natural environments. In the worst of cases, people are displaced from neighborhoods and communities in which they are deeply rooted. As Brown and Perkins discussed (1992), disruptions in place attachments threaten both individual and communal aspects of self-definitions, and stronger attachments make such disruptions more devastating. The impact of displacement after disasters has often been profoundly adverse (e.g., Erikson 1976; Norris et al. 2005b; Oliver-Smith 1986), and similar findings are highly likely to emerge in research on Hurricane Katrina (e.g., VanLandingham et al. 2007). These findings raise the possibility that place attachment could, in some circumstances, impair rather than facilitate resilience. However, it is simultaneously plausible that place attachments promote healing (Cox and Holmes 2000) and increase the likelihood that the community as a whole has the will to rebuild (Manzo and Perkins 2006).

"Citizen participation" is the engagement of community members in formal organizations, including religious congregations, school and resident associations, neighborhood watches, and self-help groups (Perkins et al. 2002; Wandersman 2000). Empowering community settings are characterized by inspired, committed leadership and by opportunities for members to play meaningful roles (Maton and Salem 1995). Wandsmerman and Florin (2000) summarized three primary areas of research on citizen participation—who participates and why, how organizational characteristics influence participation, and the effects of participation on community conditions and participants' own feelings of efficacy—that provide a sound framework for examining grass-roots participation in disaster readiness and recovery efforts. Quarantelli (1989) summarized the results of a series of observational studies of citizen groups that emerge with respect to hazardous waste sites, noting that they tend to have a small active core, a larger supporting circle that can be mobilized for specific tasks, and a greater number of nominal members. Most groups exist in conflict. Their goals are often vague and lofty at the outset but become more specific and achievable over time. These findings relate to the broader aim of understanding the "life cycle" of community organizations that form to address environmental threats (Edelstein and Wandersman 1987). Edelstein (1988) observed that leaders of citizen groups are usually those who have strongest attachments to place.

Citizen participation is widely believed to be a fundamental element for community resilience. Two of the factors hypothesized by Pfefferbaum et al. (2005) fall into this set of capacities: Participation, referring to member involvement and engagement and opportunities for such

that are sensitive to the diversity, ability, and interests of members; and Structures, Roles, and Responsibilities, referring to leadership, teamwork, clear organizational structures, well-defined roles, and management of relationships with other communities. Similarly, Ganor and Ben-Lavy (2003) argued that community resilience requires authentic, grass-roots leadership, which they labeled "credibility" in their scheme. Participation and Leadership were also two of the dimensions of community capacity described by Goodman et al. (1998).

Information and Communication

Information may be the primary resource in technical and organizational systems that enables adaptive performance (Comfort 2005). By communication, we refer to the creation of common meanings and understandings and the provision of opportunities for members to articulate needs, views, and attitudes. Pfefferbaum et al. (2005), Goodman et al. (1998), and Ganor and Ben-Lavy (2003) have all argued that good communication is essential for community resilience or capacity.

Systems and Infrastructure for Informing the Public

Information and communication become vital in emergencies. People need accurate information about the danger and behavioral options, and they need it quickly. Public adherence to recommendations cannot be taken for granted, particularly when there is marked uncertainty about exposure, consequences of exposure, or the risks involved with following the recommendations (Reissman et al. 2005). After an anthrax attack (to use Reissman et al.'s example), people are neither certain they have been exposed nor certain that prophylactic use of antibiotics can help them. How to communicate risks and recommendations most effectively to the public has been the focus of much past research, but "the link between information provision and preparedness remains tenuous" (Paton and Johnston 2001, p. 271).

On the basis of her review, Longstaff (2005, p. 55) argued that information increases survival only if is "correct and correctly transmitted." In emergencies, when there is little time to check information, it is also important that the sender of the information be trusted. Closer, local sources of information are more likely to be relied upon than unfamiliar, distant sources. In fact, Longstaff concluded, "*A trusted source of information is the most important resilience asset that any individual or group can have*" (emphasis in original, p. 62). Similarly, the Working Group on Governance Dilemmas (2004) concluded that trusted communication treats the public as a capable ally, invests in public outreach, and reflects the values and priorities of local populations.

Communication infrastructure is also a valuable resource. On the basis of their experiences in New York City after the September 11th terrorist attacks, Draper et al. (2006) maintained that it is advantageous for a life-line (or hotline) system to be in place beforehand. These communication systems can be ramped up after the disaster to coordinate and deploy volunteers, and later they provide a central means for the pubic to learn about and access services (see also Norris et al. 2006). Media also can be engaged to publicize available services and educate the public about typical reactions to disaster (e.g., Gist and Stolz 1982; Norris et al. 2006).

Communication and Narrative

The remaining element in this set, less structural than the others, is the presence of communal narratives that give the experience shared meaning and purpose. As noted by Sonn and Fisher (1998), who examined community resilience to oppression, narratives provide insight into how communities see themselves and others (see also Harvey et al. 1995; Rappaport 1995; Waller 2001). Members' shared understandings of reality contribute to a sense of place and connectedness, that in turn affect resilience (Alkon 2004). Couto (1989) described how "group formulations" (narratives and symbols) became a mechanism for empowerment in Aberfan, South Wales, after a horrific environmental disaster took the lives of 104 school-children and 20 adults. Writing about their own experiences in the aftermath of the September 11th terrorist attacks in lower Manhattan, Landau and Saul (2004) concluded that community recovery depends partly on collectively telling the story of the community's experience and response.

The media shape how a disaster is framed in ways that influence survivors' and others' understanding of the event, including emergency managers. In a fascinating analysis of disaster metaphors and myths, Tierney et al. (2006) traced the impact of exaggerated and extreme portrayals of looting and lawlessness to critical policy decisions. Three days after the New Orleans levee breach, leadership's decision to re-direct police officers to attend to lawbreakers rather than to life-saving activities lessened the survival chances of stranded residents. The authors also noted that stories like these lead many policy-makers to believe that the military should play a larger role in disaster response despite 50 years of sociological research showing that the emergency behavior of most disaster victims is orderly and prosocial.

Abramowitz (2005) conducted an extraordinary anthropological study of six Guinean communities attacked by

Sierra Leonean and Liberian forces in 2000–2001. The author collected narratives from study participants as well as measures of psychological distress. Symptoms of post-traumatic stress were nearly universal but much higher in three of the communities than in the others. Narratives revealed that in those three communities, respondents shared the feeling that government and non-governmental organizations had neglected them. They mourned the loss of their homes and markets. Social rituals and practices, including reciprocity and charity, were abandoned. There were widespread beliefs that some community members had prospered at the expense of others. Distress was present in the other communities, but less so. They had managed to maintain many social rituals, and residents shared a belief that customs and social practices would return to normal as soon as economic conditions improved. Most importantly, they had created a collective story that emphasized their resistance to the violence.

Community Competence

Endangered communities must be able to learn about their risks and options and work together flexibly and creatively to solve problems. Longstaff (2005) argued that the capacity to acquire trusted and accurate information, to reflect on that information critically, and to solve emerging problems is far more important for community resilience than is a detailed security plan that rarely foresees all contingencies (see also Comfort 2005; Handmer and Dovers 1996). This point brings us to Community Competence, which we view as the networked equivalent of human agency, a term that is more broadly applicable across levels of analysis. Community competence has to do with collective action and decision-making, capacities that may stem from collective efficacy and empowerment.

Collective Action and Decision-making

Cottrell (1976, p. 197) described a competent community as one in which "the various component parts of the community: (1) are able to collaborate effectively in identifying the problems and needs of the community; (2) can achieve a working consensus on goals and priorities; (3) can agree on ways and means to implement the agreed upon goals; and (4) can collaborate effectively in the required actions." Cottrell proposed that these competencies arose from commitment to the community as a relationship worthy of substantial effort, articulateness, communication, participation, and means for debate, discussion, and decision-making. Many of these conditions were previously considered as aspects of Social Capital or Information and Communication, so it might be said that social capital and communication are prerequisites for community competence (see Fig. 2).

Drawing heavily upon earlier writings about community competence, Brown and Kulig (1996/97, p. 30) argued effectively that "the concept of resiliency in the context of communities needs to be grounded in a notion of human agency, understood in the sense of the capacity for meaningful, intentional action. Individuals and collectives are resilient in the first sense insofar as they act in such a way as to recover from what they define as negative physical or social events. Individuals and collectives are resilient in a second sense insofar as they act to transform their physical and social environments to mitigate against such events in the future." Brown and Kulig were making the point that resilience is not simply a passive "bouncing back" (as implied by the original metaphor) because people can imagine how things might be and do things to bring those conditions about. Perez-Sales et al. (2005) made similar points from having observed the capacity of shelter residents to control their own lives after a severe earthquake in El Salvador in 2001.

The skills identified by Goodman et al. (1998) included several that are essential elements of community competence: abilities to engage constructively in group process, resolve conflicts, collect and analyze data, and resist opposing or undesirable influences (p. 261). There appears to be high consensus that critical reflection and problem solving are fundamental capacities for community competence and resilience (Bruneau et al. 2003; Goodman et al. 1998; Klein et al. 2003; Pfefferbaum et al. 2005). Ganor and Ben-Lavy (2003) emphasized the importance of the community's ability to take action, which they called "coping."

Collective action is complex and challenging in the face of environmental threats. Such threats, and concomitant disappointment in political leaders, often lead to creation of grass roots groups that represent affected families (Edelstein 1988; Oliver-Smith 1986). Sometimes, these groups are effective in building consensus and mobilizing political action and legislation, but other times, action is impeded by mistrust, conflict, or "dissensus" (Edelstein and Wandersman 1987; Kaniasty and Norris 2004). Which outcome occurs is not necessarily predictable but may depend on the extent of collective efficacy, the process of empowerment (vs. disempowerment), and the nature of political interaction (adversarial versus collaborative).

Collective Efficacy and Empowerment

"Collective efficacy" reflects trust in the effectiveness of organized community action (Perkins and Long 2002).

Sampson et al. (1997) defined collective efficacy as a composite of mutual trust and shared willingness to work for the common good of a neighborhood. In our model of community resilience, collective efficacy bridges the domains of Social Capital and Community Competence, but is placed under the latter because of its fundamental role in facilitating community action. A related concept is communal mastery, defined as the sense that individuals can overcome life challenges and obstacles through and because of their being interwoven in a close social network (Hobfoll et al. 2002). As one of their "six Cs" of community resilience, Ganor and Ben-Lavy (2003, p. 106) included "credo," "the vision of a community, one that depicts a better future, a horizon of hope." This idea is similar to that of community hope (Ahmed et al. 2004). Paton and Johnston (2001) proposed that an initial focus on promoting collective efficacy would increase the likelihood of achieving success in working with a community to adopt mitigation strategies.

Benight (2004) offered a slightly different definition of collective efficacy as the shared belief that a group can effectively meet environmental demands and improve their lives through concerted effort. In this study, collective efficacy (as perceived by the individual) interacted with resource loss after a flood to predict recovery from symptoms of posttraumatic stress. Persons with high collective efficacy were less adversely affected by their losses than were persons with low collective efficacy. In discussing his findings, Benight noted that the people he studied had responded successfully to a variety of problems after the floods by creating an organized crisis committee to speak, decide, and act on behalf of their small rural community.

Collective efficacy is highly related to empowerment (Perkins et al. 2002), a process through which people lacking an equal share of valued resources gain greater access to and control over those resources (Rappaport 1995). A particular relevant discussion of empowerment for our purposes was presented by Rich et al. (1995), who examined the dynamics of community empowerment after discovery of environmental hazards. Rich et al. reasoned that meaningful participation in environmental action groups can be empowering and, conversely, that lack of opportunity for such participation can be disempowering. The effectiveness of a community's response to a hazard is shaped by a combination of resources (such as sufficient education to understand the technical issues, money to hire lawyers or scientific advisors), a culture that permits challenges to authority, institutions that provide a basis for coordinating a response, and political mechanisms that involve citizens in decision-making. In their model, empowerment progresses through a sequence of formal empowerment (mechanisms for citizen input), intrapersonal empowerment (feelings of personal competence and confidence), instrumental empowerment (ability to participate in and influence decision, as determined by knowledge, material resources, and persuasiveness), and substantive empowerment (ability to reach decisions that solve problems). The last of these stages is virtually synonymous with our broader meaning of Community Competence.

Rich et al. (1995) furthermore noted that some political approaches to citizen involvement in decisions are more empowering than others. Whereas adversarial models grant persons the right to express concerns and advocate for their interests, they generally put citizens in the position of reacting to proposals and may require legal action that community groups can rarely afford. The adversarial model may work against efforts to create consensus. The suggested alternative is a partnership approach that "invites proactive, not just reactive, thought that may produce creative alternatives…and allows communities to move toward sustainable environmental decisions (pp. 671)."

The Network of Adaptive Capacities

Figure 2 summarizes this section by showing the four primary sets of networked resources that generate community resilience. There are innumerable possible linkages between elements in these sets (and between these elements and population wellness) that could be researched empirically across communities, a point to which we return in the final section of this paper. The utility of the framework could also be examined by means of qualitative case studies of a particular community and particular response. To recap, these resources qualify as resilience-resources (adaptive capacities) to the extent they are robust, redundant, or rapidly accessible.

Resilience as a Strategy for Disaster Readiness

Fueled by incomprehensible disasters, such as the September 11, 2001 terrorist attacks, the southeast Asian tsunami of December 26, 2004, and Hurricane Katrina on August 29, 2005, efforts to improve disaster preparedness and response have increased dramatically since the turn of the century. However, the trend toward greater preparedness in the United States was already in play. The Disaster Mitigation Act of 2000 gave new emphasis to proactive mitigation and local all-hazards plans. Discussions of the challenges and complexities of disaster management frequently allude to community resilience as an important ingredient. Some authors have speculated about the role of community resilience in local preparedness; others have advised how emergency management infrastructure can be

made more resilient; and others have illustrated how an understanding and appreciation of community resilience can guide the design of postdisaster psychosocial interventions. Community resilience may have particular value in countering the impact of terrorism (Reissman et al. 2005).

The adaptive capacities illustrated in Fig. 2 provide a roadmap for enhancing community resilience to disasters. This is perhaps more like a rotary than a highway, as one can enter and exit anywhere. Nonetheless, we describe five stops along this road that are likely to be necessary for most travelers, although other stops undoubtedly could be made as well.

First, to increase their resilience to disaster, communities must develop economic resources, reduce risk and resource inequities, and attend to their areas of greatest social vulnerability. Hazard risk is neither randomly nor evenly distributed (Cutter et al. 2003). To mitigate social vulnerability to urban hazards, Godschalk (2003) recommended that cities set aside resources to make poor neighborhoods safer. To accomplish this, city staff need to work together with each neighborhood to identify its needs and an appropriate mitigation approach. Godschalk (p. 140) also recommended that urban hazard mitigation activities be integrated with activities related to economic development and social justice, thereby "achieving the multiple objectives needed for a resilient system." Efforts to create economic diversity increase the probability that the community can withstand adversity or surprise. After a disaster, residents and grass-roots leaders should be vigilant to the equity of resource distribution. Those who need support the most may have the least access to it, and there is extensive evidence that many persons are excluded from emergent "altruistic communities" (Kaniasty and Norris 1995, 2004). Competent communities may influence these dynamics through creative problem-solving and political action.

Second, to access social capital, one of the primary resources of any community, local people must be engaged meaningfully in every step of the mitigation process. Enabled by professional practitioners, as necessary, community members must assess and address their own vulnerabilities to hazards, identify and invest in their own networks of assistance and information, and enhance their own capacities to solve problems created by known or unknown unknowns (e.g., Brown and Kulig 1996/97; Coles and Buckle 2004; Longstaff 2005; Pfefferbaum et al. 2005). Non-indigenous practitioners best foster recovery by providing settings and resources that allow the community to take charge of the direction of change (Fullilove and Saul 2006; Landau and Saul 2004; Perez-Sales et al. 2005; van den Eynde and Veno 1999). Because trauma emanates from profound powerlessness, interventions should emphasize empowerment, meaning they need to emphasize strengths, mobilize the community's capabilities, and help the community to become self-sufficient (Harvey 1996). It is critical to make use of existing resources that can be affirmed and integrated into the response plan.

Third, pre-existing organizational networks and relationships are the key to rapidly mobilizing emergency and ongoing support services for disaster survivors. Loosely coupled but cooperative systems appear to provide the best combination of linkages and flexibility (Gillespie and Murty 1994; Longstaff 2005). A series of case studies of mental health system responses to major disasters, including the Oklahoma City bombing (Norris et al. 2005b), the September 11th terrorist attacks (Norris et al. 2006), and many others (Elrod et al. 2006) repeatedly revealed that developing organizational networks, coalitions, and cooperative agreements ahead of time is crucial, and that organizational plans should indicate how key constituencies will be involved. Program directors relied upon pre-existing relationships perhaps more than any other single resource to implement programs quickly. To work together after a disaster, systems must understand and trust each other, which is challenging if they have not worked together before. For example, organizations mounting community outreach programs almost inevitably experience difficulty in entering school systems if they have not conducted programs with schools previously. This barrier may greatly interfere with programs' abilities to reach children in the community, who appear to be a group in need of additional support in the aftermath of major disasters (Norris et al. 2002a, b).

Fourth, interventions are needed that boost and protect naturally-occurring social supports in the aftermath of disasters. Fostering natural supports helps to ensure that communities and families retain the capacity to exchange emotional and instrumental support (Landau and Saul 2004). Furthermore, well-functioning social networks keep members informed about one another's relative needs and may improve equity of resource distribution. Although helping behavior and cohesion are abundant initially, they do not last, and certain social resources are not robust to the impact of disasters (Kaniasty and Norris 2004). Social support interventions are most effective when they build social skills and mutual support (Hogan et al. 2002). Ideally, postdisaster support interventions furnish participants with knowledge, attitudes, and skills that can be used to recruit their own supports (Gottlieb 1996; Layne et al. 2001).

Fifth, communities must plan, but they must also plan for not having a plan; this means that communities must exercise flexibility and focus on building effective and trusted information and communication resources that function in the face of unknowns. Uncertainty is almost

certain to exist after disasters. The most adaptive disaster management strategy is one that acknowledges complexity and uncertainty and relies on timely and trusted sources of information for rapid decision-making as opposed to rigid plans and command-and-control strategies (Longstaff 2005). In contrast to command and control styles, problem-solving approaches allow for innovation and localized variations in response. Similarly, Godschalk (2003) envisioned that "the public and private organization of a resilient city would both plan ahead and act spontaneously...They would eschew simple command and control leadership, preferring to develop networks of leadership and initiative. They would set goals and objectives, but be prepared to adapt these in light of new information and learning" (p. 139). In our age of advanced technology, flexibility remains a simple but nonetheless essential resource for managing a disaster response (Coles and Buckle 2004; Handmer and Dovers 1996; Klein et al. 2003; Norris et al. 2005b).

Summary, Conclusions, Caveats, and One More Metaphor

We have argued, as have others, that resilience is a process that leads to adaptation, not an outcome, not stability. We emphasized the likelihood that stress and crisis induce transient periods of dysfunction, but adopted wellness as the eventual outcome of interest, the manifestation of adaptation to an altered environment. This choice ties the concept of resilience to the traditional concerns of the public health and mental health fields. Wellness, as defined for individuals, incorporates the criterion of being free of psychological disorder but is explicitly more than this. Far too often, psychology papers begin by saying that we know a lot about psychopathology but little about resilience and then operationalize resilience as the lack of psychopathology. To say, "social support promotes resilience" is not very different from saying "social support prevents psychopathology" if resilience is merely the lack of psychopathology. An individual's successful adaptation, we believe, must be reflected also in healthy patterns of behavior, adequate role functioning, and satisfactory quality of life. Well communities show not only high average levels of these conditions but limited disparities in mental and behavioral health between rich and poor, young and old, White and not, men and women, and so forth.

We furthermore proposed that resilience and wellness emerge from a variety of adaptive capacities, which we defined as resources with dynamic attributes, specifically robustness, redundancy, and rapidity. By posing this definition, we aimed to integrate resilience perspectives with evidence showing that resources are not static—they evolve, strengthen, weaken, and rebound—and these trajectories are of interest in their own right. Reaching a better understanding of the impact of disasters on community resources may be the most critical and complex challenge for future research. It should be readily apparent from Fig. 2 that the network of adaptive capacities that yields community resilience is not a singular condition that can be measured or monitored simply. It is a set of sets with many dynamic attributes and transactional linkages and relationships, far more than are shown in our diagram. Moreover, political, economic, and natural forces operating at larger ecological levels undoubtedly influence these capacities that operate at the community level. That said, the capacities identified here are all potentially observable by using a mixture of quantitative and qualitative methodologies, and recent work is advancing our ability to assess various factors that influence or reflect community resilience (Bruneau et al. 2003; Centre for Community Enterprise 2000; Gibbon et al. 2002; Pfefferbaum et al. 2005; Rose 2004).

Our primary hope is to foster creative thinking about how various pathways between Economic Development, Social Capital, Information and Communication, and Community Competence shape disaster readiness and recovery: Which of these resources are most likely to be robust, meaning they are strong and able to withstand the impact of a major disaster? Which may be substitutable for others, thereby building redundancy? Which resources can be mobilized rapidly in the aftermath of disaster if they are not present or strong in advance? Does diversity of economic resources make equity of resource distribution more likely or maybe less necessary? When social capital via informal ties is strong, is social capital via formal ties less important? Is there any resource that, taken alone, is necessary (likely) or sufficient (unlikely) for resilience? Can disasters create new roles and leaders and galvanize community competence? Can community competence then foster equity of resource distribution that in turn boosts social support? Can communities work with trusted sources of information and media to control discourse, counteract myths, and create hopeful narratives about the event? How do these psychosocial dimensions relate to social vulnerability, as it has been measured objectively by geographers and social scientists, or to demographic change in disaster-stricken areas?

Of course, there is then the question of how strongly the various adaptive capacities in this network contribute to the wellness of constituent populations. To date research on the outcomes of community resilience is meager. Some studies have examined how individual-level perceptions of community resilience (Kimhi and Shamai 2004; Pooley et al. 2006), sense of community (Paton et al. 2001), or collective efficacy (Benight 2004) correlate with individual-level outcomes, but no study, to our knowledge, has truly

examined how independently assessed community resources influence the postdisaster wellness of constituent populations. This is not a simple matter, but methods exist that can facilitate multi-level epidemiologic research (Kawachi and Subramanian 2006; Perkins and Taylor 1996).

The "prevention paradox" (Rose 1981, 2001) is extremely important for future judgments regarding the relative influence (and significance for policy) of individual and community resilience-resources. As we noted earlier, effects that seem small in analyses of individuals may be quite large when extrapolated to populations. Traditional risk (or protective) factor research is almost assured to find that individual-level resilience-resources (e.g., self-efficacy) have stronger effects within a study population than do community-level resilience-resources (e.g., collective-efficacy). This makes perfect sense from an ecological perspective that distinguishes between proximal and distal influences on individual resilience and wellness, in turn. But proximal determinants protect only certain individuals, whereas distal effects protect everyone. If the underlying cause of an illness can be removed from the population, susceptibility of individuals within the population ceases to matter (Rose 2001).

It follows from this argument that community resilience has extraordinary value as a strategy for disaster readiness. Unlike many stressors, disasters happen to entire communities. Members are exposed together and must recover together. At minimum, if their aim is to build collective resilience, communities must develop economic resources, reduce risk and resource inequities, and attend conscientiously to their areas of greatest social vulnerability. They must engage local people in every step of the mitigation process, create organizational linkages and relationships in advance of disasters, and boost and protect naturally occurring social supports. They must plan—but also plan for not having a plan, which means that community organizations must appreciate flexibility, develop decision-making skills, and cultivate trusted sources of information (Longstaff 2005). In a nutshell, disaster readiness is about social change.

Turning to caveats, we note several complications. First, the benefits of particular resources may vary across levels of analysis. Place attachment is a good example. As noted earlier, for the individual, it is plausible that a strong attachment to the place of origin could decrease resilience if a disaster forces relocation. It is simultaneously plausible that those same attachments increase the likelihood that the community as a whole has the will to rebuild (Manzo and Perkins 2006). This example also highlights the shift in our thinking that a community perspective requires. The benefits of living in a community characterized by strong place attachments do not accrue only, or even necessarily, to those individuals who feel the attachments most strongly. Rather the attachments create a better environment for all who live in that place. A related complication is that the benefits of particular resources compete with their costs. For example, it is possible that a strong sense of community could expand the adverse effects of a terrorist attack by increasing residents' identification with those individuals who were most directly harmed (Maguen 2005). Close communities may also generate "insider-outsider" dynamics that limit receptivity to external sources of disaster assistance (Edelstein and Wandersman 1987; Norris et al. 2005b). It is our belief that, in the long-run, the benefits of community bonds will outweigh these costs, but this is ultimately an empirical question. Rutter (1993, p. 627) similarly concluded, "We must get away from thinking in terms of characteristics that are always risky or always protective in their effects and, instead, focus on the specific processes that operate in particular circumstances for particular outcomes."

Second, we have said nothing about culture here. The theory, adaptive capacities, and strategies that we have described in this paper have nothing and everything to do with culture. On the one hand, the work on community resilience cited in this paper spanned the continents of Asia, Africa, Australia, and South, Central, and North America. We cannot envision a human culture or society in which the basic concepts of stress and disaster, resources, crisis, adaptation, and wellness do not apply. We cannot imagine a human culture or society in which economic development, social capital, communication, and competence are irrelevant. We would be surprised to find a human culture or society whose disaster readiness was not enhanced by reducing risk and resource inequities, engaging local people, creating linkages, boosting supports, and planning for not having a plan. On the other hand, the manifestations and collaterals of these constructs are undoubtedly culture-specific. Mechanisms for assuring economic and social security are often based on long-held traditions, such as the relative degree of filial responsibility (de Vries 1995). Social support is universally relevant, but facets such as reciprocity norms, relative comfort with kin and non-kin, and modes of expressing emotional support vary substantially across cultures (de Vries 1995; Kaniasty and Norris 2000; Oliver-Smith 1986). Local meanings of community strongly influence openness to change and acceptability of resettlement (Oliver-Smith 1986). Grassroots action is facilitated by cultures that permit challenges to authority (Rich et al. 1995). Any earnest attempt to explore resilience in a particular community will feature local culture and mores prominently (Oliver-Smith 1986; Rich et al. 1995; Vega 1992).

Third, there is one discomforting issue that must be addressed. If resilience serves mainly as an inspirational

concept (perhaps as a narrative in and of itself), there is something to be said for viewing it as an inevitable, inherent, universal quality of the human spirit. If resilience has utility as a scientific or strategic concept, this cannot be the case. Communities with high rates of posttraumatic stress disorder or substance abuse or domestic violence or child maltreatment cannot be said to be well. If these or similarly severe problems emerge and persist in the aftermath of a disaster, the community has not exhibited resilience. This unpleasant conclusion is more palatable if one remembers that resilience is not an immutable characteristic that a community has or does not have but is instead a process that emerges from malleable resources. If resilience is not evident, we are directed to formulate hypotheses about why the process has stalled and how it might be ignited once again. Our proposed network of adaptive capacities provides a strategic map for making decisions about where on this road (or rotary) to begin.

Our fourth and final caveat, somewhat related to the previous one, is to caution against potential unwanted consequences of a resilience frame for research and practice in disaster mental health. It would not be too difficult for the concept of resilience to erode into one more way of stigmatizing suffering individuals and communities. Although the contribution of resilience theory is its greater emphasis on adaptive capacities, we should not loose sight of the fundamental role of the stressor. There are horrendous disasters from which even the most resourceful individuals or communities would struggle mightily to recover. No community is always vulnerable, for how would it survive, and no community is always resilient. (For similar perspectives see Rutter 1993; Waller 2001). Likewise, we hope that the concept of resilience does not erode into a justification for denying help to individuals or communities in crisis. Like social capital (Perkins et al. 2002), resilience is an easy concept to co-opt as a basis for arguing that community-based interventions are unnecessary when, quite the contrary, disasters are times when community resources may require the greatest boost.

In conclusion, as a framework for understanding and building strong communities, resilience's scientific value lies not in whether it can be easily captured and quantified but in whether it leads to novel hypotheses about the characteristics of—and relations between—stressors, various adaptive capacities, and wellness over time. Its strategic value lies not, or not only, in its inspirational message but in whether it leads to effective interventions and policies that increase the probability of adaptation by enhancing adaptive capacities. Resilience is only an abstraction and maybe only a metaphor. Dangerously ending this paper where we began by using one last metaphor from physics, we note that there is no variable called "relativity" in the Theory of Relativity. Nonetheless, the theory led to revolutionary hypotheses about the relations between energy, mass, and the speed of light.

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