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Resilience: a new integrative approach to health and mental health research

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REVIEW ARTICLE

Resilience: a new integrative approach to health and mental health research

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We know from anecdote and research, science and art, that human resilience is a powerful, seemingly ubiquitous force. What is needed is a better understanding of the properties, variations, and applications of that concept to health and well-being. In this paper we put forth two definitions of *resilience:* Sustainability of purpose in the face of stress, and recovery from adversity. We review current thinking in the social sciences on the nature of biological, psychological and socio-community processes that may confer resilience. In doing so, we encourage greater attention to aspects of biopsychosocial resourcefulness as a dimension of influence on health and mental health distinct from measures of risk found in standard models of public health inquiry. Multi-level, longitudinal, and intervention methods are advocated for research and applications of the concept with conceptual guidelines for the examination of laboratory, diary, and community indicator data on manifestations of resilience across the life span.

Keywords: resilience; health; community; interventions; methods and measurement

Beginning with the Framingham studies (Dawber, Meadors, & Moore, 1951), risk factor research has a long and successful history of identifying biological and psychosocial vulnerabilities to chronic as well as acute illness. As a consequence, by age 65, most if not all Americans will harbour some significant risk for a life-threatening illness. Yet, those who live that long may be expected to live an average of 20 more years. In addition, the National Academy of Sciences finds a decrease in disability rates – falling under 20% for the first time in 2000 – among elders citing education, diet, exercise, medical and public health advances all leading to a more vigorous and healthy old age (National Research Council, 2001). Even centenarians profess a level of happiness that rivals that of younger groups and laugh at least as often (Jopp & Smith, 2006). How do these people sustain themselves while ill, and how did so many who were ill, recover?

The pursuit of knowledge about these capacities is not just about those individuals who beat the odds. There are also considerable anomalies in the community health data (Evens, Barer, & Marmor, 1994) – levels of illness and disablement that cannot be accounted for in the accumulation of risk indices, and surprisingly high levels of functional health in the face of physical illness that cannot be explained by risk factor research. Social status, for

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example, confers health advantage even after the calculation of multivariate risk ratios between risk and poor health (Marmot & Fuhrer, 2004). Further, there are apparent paradoxes in the findings for some groups that cut against the social gradient (Heidrich & Ryff, 1993). The best known among them is the Hispanic paradox. Even at high risk on the standard indicators, those with strong attachment to their Hispanic heritage appear healthier as a group than their social status would warrant (Fuentes-Afflick, Hessol, & Perez-Stable, 1999; Gould, Madan, Qin, & Chavez, 2003).

These anomalies may be due to a matrix of factors woven within the fabric of the lives of people and their communities that confer resilience. Indices of this capacity for resilience may be found within the person, his/her primary network of kith and kin, and the socio-cultural profiles of the neighbourhood and community settings. In this paper we offer resilience as an integrative construct that provides an approach to understanding how people and their communities achieve and sustain health and well-being in the face of adversity. Our aim is to define resilience based on current thinking in biopsychosocial disciplines, outline key research methods employed to study resilience and offer how this approach may further the development of public health and other intervention programmes designed to promote health and wellbeing.

What is resilience?

We begin with definitions of the term. The need for clarity here is made all the more important by its popularity in everyday discourse, becoming what Rutter (1999) has called the 'millennium Rorschach'. Until recently, scholarly work on resilience was the sole providence of developmental psychology (Luthar, 2006). In that arena, resilience has been studied as a dynamic process of successful adaptation to adversity revealed through the lens of developmental psychopathology. Across research and practice, there has been considerable debate over the definition and operationalisation of resilience (Luthar, Cicchetti, & Becker, 2000). Is resilience best categorised as a process, an individual trait, a dynamic developmental process, an outcome, or all of the above? In addition, where does one draw the line at successful and resilient adaptation versus non-resilient responses?

In our view, resilience is best defined as an outcome of successful adaptation to adversity. Characteristics of the person and situation may identify resilient processes, but only if they lead to healthier outcomes following stressful circumstances. Two fundamental questions need to be asked when inquiring about resilience. First is *Recovery,* or how well do people bounce back and recover fully from challenge (Masten, 2001; Rutter, 1987)? People who are resilient display a greater capacity to quickly regain equilibrium physiologically, psychologically, and in social relations following stressful events. Second, and equally important, is *Sustainability*, or the capacity to continue forward in the face of adversity (Bonanno, 2004). To address this aspect of resilience we ask, how well do people sustain health and psychological well-being in a dynamic and challenging environment?

Definition 1. Recovery: from risk to resilience

One of the problems we have in understanding the processes of recovery from stressful events is that most models of health and mental health have not developed an adequate understanding of the meaning of recovery, leading to shortcomings in measurement. This problem is made even more apparent by the frequency with which people and communities actually recover from adversity. Masten (2001), in referring to the many children who survive difficult, even abusive, home environments, called it 'ordinary magic'. It would be

most consistent with what we observe in human communities to see resilience as a natural capacity to recover and perhaps even further one's adaptive capacities. In fact, the modal response to calamity in our community studies has not been despair but 'to see the silver lining'. People report they 'discovered what really mattered in life', 'found out how much others cared', and 'uncovered hidden strengths within (or hidden capacities for generosity in others)' (Zautra, 2003). Researchers who have focused narrowly on developmental risk often see resilience in response to adversity as the exception rather than the rule (Luthar, 2006). In our view, people are extraordinary, and it is common, not rare, to observe these feats of resilience in children (Garmezy, 1991) and across the life span (Bonanno, 2004; Greve & Staudinger, 2006). Some initial psychological distress following stressful experiences is expected, and may even be potentially beneficial to adaptation. From a resilience perspective, speed and thoroughness of recovery from harm are the key outcomes to observe. A resilient 'recovery' may not be without some remaining emotional 'scars' but it is often well beyond what our models of psychopathology would have predicted. A broader and more differentiated view of health and mental health would be a place to start to capture these resilience experiences.

Although the resilience response may be universal, it is likely that we are not all the same in this capacity, nor are the environmental forces that strengthen or weaken resilience to stress distributed equally in the population. People differ in their inner strength, flexibility, and 'reserve capacity' (Gallo, Bogart, Vranceanu, & Matthews, 2005). Further, the responsiveness of social and physical environment differs from one family to another and from one community to the next (Garmezy, 1991). Some resilience researchers have focused on personality features (e.g., Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdat, 2006), and given relatively short shrift to the social environmental determinants of response capacities of individuals. Yet, without attention to social as well as psychological capital within our communities, models of resilience may have limited applicability. A social and community psychology of resilience is needed if we are to understand why many of us are not always able to preserve well-being and sustain our progress towards the goals we have set out for ourselves and those we care for (Cowen, 1994).

We often fail to recognise that communities recover as well. In fact, recovery from horrific devastation is one of the most important themes of the history of cities. As chronicled in *The Resilient City* (Vale & Campanella, 2005) cities have been destroyed throughout history, 'sacked, shaken, burned, bombed, flooded, starved, irradiated, and poisoned'. Only 42 cities worldwide were permanently abandoned (Chandler & Fox, 1974), and all others have recovered, rising like the mythic phoenix. As Kelly (1970) has reminded us, adaptation principles apply as much to human communities as they do to other ecosystems. Communities clearly recover, how they do so remains in question.

Definition 2. Sustaining pursuit of the positive

The second major definition of resilience is adopted from the field of ecology, and is linked directly to the concept of reserve capacity. Holling, Schindler, Walker, and Roughgarden (1995) define the resilience of an ecosystem as its capacity to absorb perturbations/ disturbances before fundamental changes occur in the state of that system. By changes in state, Holling et al. (1995) and others (Adger, 2000) do not mean a change in the level of a given profile of interactions, but a dynamic non-linear change in the nature of the relationships among the constituent parts of the system. When people reach and go beyond their 'tipping points' in response to events (Gladwell, 2002), we observe not simply a

change in levels of cognition, affect and behaviour, but a change in the nature of the relationship among these core elements of the human response.

The study of chronic pain patients provides one illustration. During episodes of pain and stress, there are changes not only in level of negative emotion but also changes in the relationship between positive and negative states revealing a reduction in the complexity of a person's affective experiences (Zautra, 2003; Zautra et al., 2005). Based on these findings, it seems that heightened stress and pain lower the capacity of the person to distinguish positive from the absence of negative emotion, lowering the sustainability of positive affective engagement. Kelly (1955) was among the first to point out that the constructs we use to understand ourselves are oriented to the prediction and control of future events. We follow his lead in proposing that the natural course of one's life has a forward lean towards engagement, purpose, and perseverance. Mind–body homeostasis is not sustained by emotional neutrality, but by ongoing, purposeful, affective engagement. From this perspective, resilience is expected to extend beyond the boundaries of a person's capacity to stave off pathological states or a community's ability to recover from a disaster, and thus include sustaining pursuits of the positive. In this sense, individual resilience may be defined by the amount of stress that a person can endure without a fundamental change in capacity to pursue aims that give life meaning. The greater a person's capacity to stay on a satisfying life course, the greater their resilience. Whereas resilient 'recovery' focuses on aspects of healing of wounds, 'sustainability' calls attention to outcomes relevant to preserving valuable engagements in life's tasks at work, play and in social relations.

Behavioural scientists as well as clinicians, unaware of the shortcomings of their conceptual models of health and mental health, have difficulty understanding the discontinuities between a person's level of suffering and their capacity for psychological growth. Attributes of the positive like 'satisfying life course' are often left undefined, or, defined based on the absence of some negative attribute. Yet we all know people and communities who appear perfectly adjusted to their circumstances but who have not the capacity to plan for themselves. Their ship is still in the harbour. We know of people who carry full diagnoses of illness, even mental illness, who yet show spark and wit and perseverance remarkable for even the healthiest of us. The absence of illness and pain is no guarantee of a good life. Some paradigms within the clinical sciences have focused much on revealing hidden pathologies within us but have often appeared blind to the natural capacities of people, even those who are ill, to resolve problems, bounce back from adversity, find, and sustain energy in the pursuit of life's goals.

There are parallels in the study of communities. We often define the quality of life within a community by the absence of crime, the safe streets, the convenience to stores selling everyday commodities, and a relatively unfettered path from home to work, and back again. If this was all that attracted us to community, though, no one would bother with Manhattan, San Francisco, or Los Angeles. These very diverse, vibrant places prosper because they attend to the basics as well as provide high levels of stimulation and opportunity even though they may introduce more hazards into everyday life (Florida, 2004). People need the structure of a coherently organised physical environment that affords them basic goods. They also benefit from communities that support their needs for social connection and psychological growth. Resilient community structures build on peoples' hopes as well as provide a means of circling the wagons to provide a 'defensible space'. We need definitions that go beyond the absence of problems: not just risk, but also capacity, thoughtfulness, planning, and a forward-leaning orientation including attainable goals and a realistic vision for the community as a whole.

How does our focus on sustainability of the positive as resilient compare in saliency to recovery? The capacity to mount effective responses to stress and resist illness is a fundamental imperative. But survival is not enough for resilience. A fulfilling life is also fundamental to well-being, so changes that affect our plans and goals for ourselves, our families, and our communities need attention as well.

What contributes to these capacities, and how to foster these processes within people and their communities are the key questions that need to be addressed by resilience researchers. New innovative programmes focused on resilience are underway and would benefit from paradigm guidance and a better articulated and integrative set of methodologies. Next, we examine measures and methods that may be useful in the study of resilience within people and across communities. One distinction is important to keep in mind: R*esilience is an outcome* of successful adaptation to adversity revealed by either sustainability, recovery or both. Resilient processes are those that have garnered empirical support as variables that increase the likelihood of those outcomes. For the field to advance it is essential to keep the processes and outcomes distinct. Doing so allows us to develop ways to examine the evidence for resilience processes without confusing independent from dependent variables (see also Greve & Staudinger, 2006).

Identifying indicators of resilience processes

At this stage of resilience research, social scientists have advanced the field with propositions regarding the key biopsychosocial processes that further recovery and sustainability (e.g., Hawkley et al., 2005; Ong, Bergeman, & Bisconti, 2004). Reliable measures of core aspects of positive mental health (Ryff & Keyes, 1995), personal agency, emotional maturity, and subjective well-being (Vaillant, 2003) have provided substantive means of evaluating those propositions. Further, Charney (2004) and Curtis and Cicchetti (2003) have reviewed potential neuro-hormonal and genetic processes that may yield physiological markers of resilience. Greater specificity in reliable measurement is increasingly available across the levels of inquiry.

A key question for resilience research is how new indicators of resourcefulness differ from established ones of vulnerability. Table 1 shows how such indices of resilient processes compare to more conventional indices of risk across different levels of analysis. On the left side are examples of risk factors culled from studies of health risk beginning with Framingham (Dawber et al., 1951). These 'usual suspects' are well-established markers of high risk for a number of health problems as people age. On the right side of the graph is a contrasting set of variables that identify biopsychosocial and community resources. Many of these indices have been associated with better psychological and physiological functioning, but far fewer studies have been conducted on the positive side of the ledger. Table 1 is meant to be illustrative rather than exhaustive.

Resilience processes as a separate dimension

The evidence to date indicates that resilience resources such as we have outlined in Table 1 are not qualities found at the positive end of a single continuum of risk, but as a separable dimension of well-being altogether, which confers unique health and mental health advantages not accounted for by assessments of relative risk (e.g., Steptoe, Wardle, & Marmot, 2005). To characterise the nature of risk and resilience we need models that contain at least two separate factors: One that estimates vulnerabilities, and another, strengths (Zautra, 2003).

Table 1. Risk and resilience resource indices.

Risk factor index	Resilience resource index
Biological	
Blood pressure: diastolic >90, systolic >140	Heart rate variability
Cholesterol >240 mg, resting glucose >124, BMI >25	Regular physical exercise
Genetic factors associated with anxiety	Genetic factors associated with stress resilience
High C-reactive protein and/or other elevations in inflammatory processes	Immune responsivity and regulation
Individual	
History of mental illness	Positive emotional resources
Depression/helplessness	Hope/optimism/agency
Traumatic brain injury	High cognitive functioning, learning/memory and executive functioning
Interpersonal/Family	
History of childhood trauma/adult abuse	Secure kith/kin relations
Chronic social stress	Close social ties
Community/Organisational	
Presence of environmental hazards	Green space and engaging in the natural environment through community gardening
Violent crime rates	Volunteerism
Stressful work environment	Satisfying work life

One reason we need to distinguish dimensions is that they address two fundamentally different motivational processes: The need to protect and defend against harm, and the need to move forward, and to extend one's reach towards positive aims (Bernston, Caccioppo, & Gardner, 1999). These processes infuse a two-dimensional meaning structure to emotion, cognition, and behavioural intention. Indeed, neurophysiological responses, including both EEG and fMRI data, support distinct neural structures for the regulation of positive as opposed to negative emotive responses (Canli et al., 2001; Watson, Wiese, Vaidya, & Tellegen, 1999). Underlying cognitions of personal control and mastery show two dimensions (Reich & Zautra, 1991): One of agency, optimism and hope, and another of helplessness, pessimism and despair. Social relations have similar bifurcated structures. The extent of negative social ties does not predict the extent of positive social ties (Finch, Okun, Barrera, Zautra, & Reich, 1989). Even within intimate spouse relations, the extent of negative social interaction does not account for the extent of positive exchanges between partners (Stone & Neale, 1982).

When investigators have constructed separate indices of positive and negative aspects of the person and/or social relations, they have uncovered surprising currency for positive aspects in prediction of health and illness unaccounted for in measures taken of negative affective dimensions (Cohen, Doyle, Turner, Alper, & Skoner, 2003; Moskowitz, 2003; Pressman & Cohen, 2005; Russek & Schwartz, 1997; Seeman et al., 1995). Laughter, positive affect, optimism, emotional range as well as maturity (Vaillant & Mukamal, 2001), the capacity for empathy and support for others all may infuse people with potentially life-sustaining resources even in the face of considerable distress (Zautra, Johnson, & Davis, 2005). In collaboration with other investigators, we have conducted three studies of risk and resilience with patients challenged by chronic pain disorders (Furlong, Zautra, Puente, López, & Valero, in press; Johnson-Wright, Zautra, & Going, in press; Smith & Zautra, in

press). Each of these studies examined whether measures of resilient resources formed separate factors and predicted health outcomes over and above risk factors with patients with rheumatic conditions, including rheumatoid arthritis, osteoarthritis and fibromyalgia. Although each study relied on somewhat different predictors and different health outcomes, each found evidence of separate but inversely correlated factors of resilience and risk, and in each case the resilience factors predicted key health outcomes after controlling for risk. The Smith and Zautra (in press) study of rheumatoid arthritis patients, for example, identified a resilience factor comprised of measures of active coping, acceptance, positive reinterpretation and growth, purpose in life and optimism that had a modest negative correlation ($r = -0.31$) with a vulnerability factor containing scales measuring anxiety, depression, interpersonal sensitivity, and pessimism. Scores on vulnerability (but not resilience) predicted daily fluctuations in negative affect, including elevations in negative emotion on days of elevated pain. Those participants high on resilience reported more everyday positive interpersonal events, more positive emotion, and greater responsivity to daily positive interpersonal events. Vulnerability scores were unrelated to those positive affective outcomes.

Indicators of individual resilience: resources and outcomes

At the level of the individual, resilience concepts have led researchers to develop indices of *positive adaptation*, with items like, 'I tend to bounce back quickly after hard times' (e.g., Smith et al., in press). They constitute self-report measures of resilient outcomes. In child development, this research has focused on competence and adaptation, stating that adaptation is identified by successfully meeting developmental criteria (Luthar, 2006). For adults and the elderly, preservation of health and well-being in the face of adversity provide key resilience outcomes. Here we urge further work to distinguish between the resilience outcomes of recovery and sustainability. Speed with which a person regains physiological homeostasis following inflammation from an autoimmune flare is one example of *Recovery* aspects of resilience. The length of time to return to pre-stress levels of depression is an example of recovery in mental health. In contrast, *Sustainability* in mental health would be revealed by the preservation of energy and commitment to purposeful engagements in work and family life under the adaptation challenges imposed by psychosocial distress. For example, resilience may be examined through estimates of sustainability of daily physical functioning under the stress of an episode of chronic pain. In a recent public health study, retention of 20 or more teeth was used as the primary index of resilience to urban poverty (Sanders, Lim, & Sohn, 2008).

To assess resilience resources, the researcher needs to be guided by theoretical models of how people adapt successfully to stressful events. To date emphasis has been placed on variables linked by theory and/or data to greater endurance. Investigators have begun to examine several key variables of this capacity including measures of coping, flexibility, personal agency, sense of purpose, positive emotional engagement in daily life at home, work, and at play, emotion regulation, and indicators of physiological buoyancy such as heart rate variability (Connor & Davidson, 2003; Keyes, 2004; Masten & Powell, 2003; Ryff & Singer, 1998; Seligman & Csikszentmihalyi, 2000).

Public health researchers have studied related processes for some time as antidotes to stress and vulnerability. Two examples of this emphasis are the study of social support (Berkman & Glass, 2000) and personal control (Pearlin & Schooler, 1978; Reich & Zautra, 1990; Schulz, 1976), both seen as resources that promote adaptation to stressful situations. Indeed, concepts of personal mastery and social support are among the most thoroughly

conceptualised, researched, and applied concepts in all the social sciences (Coyne & Downey, 1991; Skinner, 1996). The perception that one can achieve desirable goals and retain a sense of mastery when life events threaten one's personal control beliefs defines the resilient individual. Further, the person's social world provides the meaning structures and supportive resources that enable individuals to meet adaptation challenges. A science of resilience utilises the best of these approaches in the development of indices that promote recovery and/or sustainability.

Some candidate indicators of community resilience

As with individual research, examination of community-level variables has grown out of a risk-based tradition. There are numerous assessments that focus on community risk such as crowded housing, poverty, high school drop out rates, and income inequality promoted by the urban 'Hardship Index', now in its third edition (Montiel, Nathan, & Wright, 2004). Other indices and models that focus on community and neighbourhood stress such as the Community Stress Index (CSI, Ewart & Suchday, 2002) and measures of neighbourhood problems (Steptoe & Feldman, 2001) have also been developed to examine psychosocial effects of environmental stress. Links between neighbourhood stress and deprivation and individual mortality and illness constitute an important field of inquiry in public health (e.g., Tonne et al., 2005).

As Beck (1992) has noted, we tend to focus on living in a 'risk society' where our public policies, social services, non-profit and other organisations work to identify problems and areas of weakness in our communities and in turn attempt to alleviate those symptoms. In fact, neighbourhood crime and safety studies and studies of poverty alleviation, welfare reform, economic development of poor inner city neighbourhoods, and so forth represent a virtual subfield of urban inquiry. Even former Senator Daniel Patrick Moynihan, remembered in part for his famous critique of the poverty industry complex, accepted the risk society model: 'Well, life really is about risk and it ends badly'. Such attitudes and beliefs trickle down from policies and community leaders to colour the way people construe their life experiences, and their motivations.

However, the last two decades have given way to an outcropping of research on community resources that foster resilience. At the forefront of this research, extensive examinations of *social capital* have underscored the importance of social trust, reciprocity, neighbourhood efficacy, and civic engagement in many aspects of community life (Coleman, 1990; Portes, 2000; Putnam, 2000; Putnam, Felstein, & Cohen, 2003; Putnam, Leonardi, & Nanetti, 1993). Not surprisingly given the importance of social support and personal mastery as resources that promote adaptation to the most stressful situations, social connectedness and cohesion have been shown to be linked to greater vitality and stability in communities (Langdon, 1997). Studies probing the link between different indicators of social capital and health outcomes (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Veenstra et al., 2005) and research empirically examining the 'mosaic' of community risk and protective factors continue to highlight the critical influence of place on individuals (Fitzpatrick & LaGory, 2003). These studies help us understand the complex and variable matrix of capacities that communities rely on to enhance the physical, mental and financial outcomes of their constituents and the individual consequences of developing greater social and human capital.

Just as some individuals appear more resilient than others, similar variation in resilience capacity has been found among communities (Chaskin, Brown, Venkatesh, & Vidal, 2001; Vale & Campanella, 2005). This general finding raises profoundly important

questions about the nature of the relationship between individual and community resilience and the community role in crafting deeper wells of resilience. To what extent do communities teach, or instil resilience in people as opposed to either nurturing or blunting resilience tendencies that people bring to a situation? How much of the variation in community resilience can be manipulated by community programmes, resource and activities versus variance that is more predetermined ranging from genetic determinants to some social, economic, and educational factors that are difficult to change?

Previous research has developed several hypotheses and potential advances in identifying key factors of community resilience capacity, but less hard data with which to discern how best to conceptualise and assess these qualities (Flower, 1994; National Civic League, 1999). These questions call for thorough empirical study grounded in theory and guided by advanced methods of inquiry that rely on multi-level framework for conceptualising and evaluating the relationships between indices of social, community and personal capacity. We suggest attention to distinctions between recovery and sustainability may add clarity to research linking social worlds to health outcomes. Wen, Browning, and Cagney (2007), for example, studied neighbourhood correlates of physical exercise, a good indicator of sustainability of health. Other researchers may attend to neighbourhood rates of recovery following illness. Different community factors may be responsible for sustainability versus recovery outcomes.[1]

A working hypothesis that guides current research on community resilience is that communities, like people, can be taught to be resilient. But we are learning that this is not an endeavour of quick and easy fixes. Communities must also nurture and build resilience from existing natural relationships and among existing institutions. For communities as well as individuals, sustainable resilience capacities are built over time, require a focus (often a refocus) on strengths not weaknesses, and rest on improved self-organisation, self-control (mastery), and social connection.

The bridge from culture to health is built across neighbourhoods and communities that connect individuals who share common space as well as common ground to support a collective hope and efficacy (Duncan, Duncan, Okut, Strycker, & Hix-Small, 2003). Research on racial segregation and health disparities has shown how neighbourhood resources can profoundly influence individual health outcomes (e.g., St. Luke's Health Initiatives, 2008a). These research efforts indicate that communities vary dramatically in their capacity to promote and sustain health and healthy communities (Kretzman & McKnight, 1993). Yet, studies that have examined the relations between community-level factors like social capital and person-level variables like health have had mixed results (Carpiano, 2006; Portes, 2000; Ziersch, Baum, Macdougall, & Putland, 2005), suggesting we have only begun to understand the boundaries of influence of the social domain on individuals.

Inconsistencies are not surprising given that different variables have been used in each study to describe community capacity, resilience, health, and well-being. In addition, many questions remain in community research, such as how to define communities, and isolate their effects beyond that of individual variables. Communities are complex, as are the few partial theories explored by analyses of these variables (Bourdieu, 1986; Coleman, 1990; O'Campo, 2003; Portes, 2000; Szreter & Woolcock, 2004). Broad descriptive analyses of community factors that range from socio-economic to environmental, from crime statistics to educational outcomes are now available, but they lack integrative focus. Research papers are brimming with hypotheses identifying key factors of community capacity, but little hard data with which to discern how best to conceptualise and assess these qualities

(Flower, 1994; Hall, 2002; National Civic League, 1999). Both individual and community inquiry would benefit from integrative theory and multi-level approach to this research.

Methods of inquiry and resilience outcomes

Longitudinal design

To develop the appropriate technologies for the study of resilience we need to follow a few basic principles. First, we need to study resilience over time. People develop themes in their lives that offer them hope, optimism, purpose, emotional clarity and a wisdom built on a complex and accepting view of their social relationships. But they do not do so all at once. Resilience takes time to unfold. Further, there are many bumps along the way, periods of life when many people look anything but resilient. If we fail to keep the cameras rolling past the point of an illness episode we miss capturing the evidence we seek. A focus on the presence or absence of the episode leads us to see people as healthy only until they exhibit signs of illness. Then they are sick. This way of thinking places enormous constraints on the development of constructs that can inform our understanding of adaptation across the life span. For example, a person may be nourished by awareness of complex and, at times, painful emotions: a benefit not always immediately apparent. Only through longitudinal observation and carefully conducted birth cohort studies (e.g., Silva & Stanton, 1996) peppered with qualitative evidence from life-changing narratives do we discover how the person has been and can yet be resilient (McAdams, 2006).

Developmental tasks are natural challenges to resilience that come about across the life span, identifying problems as well as revealing hidden capacities within. People who look resilient in youth may not retain their resilient capacities in later life, though we suspect that the qualities that make one resilient do tend to generalise to other situations and continue to support successful adaptation and recovery later in life. The degree of cross-situational consistency and stability of resilience over time are important to investigate in future studies. Both the development of these capacities and their sustainability requires us to understand the trajectories of the resilient mind and body over the life course.

Several longitudinal studies within developmental psychology provide a starting point for such inquiry. A seminal study by Werner and Smith (2001) followed children on the island of Kauai from infancy through adulthood with the initial sample targeting all pregnancies on the island in a given year. Through data collection and analysis spanning 40 years, this research has been able to identify key risk and protective factors that influence outcomes across child development and into adulthood. This study along with other major longitudinal studies within child development (see Luthar, 2006 for a review) provide a framework for tracking resilient development among children and adolescents over time and in their transitions into adulthood. Although resilience research in child development provides a critical foundation, longitudinal inquiries of health and wellbeing across adulthood introduce unique challenges (Ong, Bergeman, Bisconti, & Wallace, 2006). The specific risk and protective factors, and their salience to the desired goals for competence and adaptation will vary across the life span, influenced by culture and context.

Resilience research with adults must also address physical health, a domain diminished in the child literature due to difficulty in detection of physiological processes in the early years of life that increase risk for illness later. To fully understand resilience in adults, we advocate a mind–body approach that incorporates both physical and mental health, and the interactions between the two. The Framingham study (Dawber et al., 1951) has identified many critical risk factors for illness and pathology over the course of adulthood.

The next question is then, what are the predictors of continued good health and functioning throughout life? Antonovsky (1987) identifies 'generalized resistance resources (GRR)' as the attributes and resources that help individuals to maintain homeostasis and maintain optimal health. Others too (Evans & Stoddart, 1990; Singer & Ryff, 2001) have recognised the need to examine not only trajectories of illness but also trajectories of health. Resilience theories that provide coherent and integrative biopsychosocial models of adaptation would provide this type of inquiry.

Multi-level analysis

We define the content of inquiries into resilience as (1) the study of the processes of recovery from adversity; and (2) the processes underlying sustainability of purpose. The best methods to advance these inquiries are multi-level: The examination of resilience capacities at the levels of the biological, psychological, social and organisational–community. Although any one study may focus on core manifestations of resilience at one or two levels, a full understanding of resilience requires methods that can examine how levels interact in the prediction of resilience in the face of adversity.

The examination of resilience at the level of community poses formidable challenges to researchers. Yet, communities of location (Black & Hughes, 2001) provide the context in which all individuals, spanning life cycles, income brackets and cultural heritage, work, love and live. The complexity of communities provides considerable methodological challenges, demanding multi-level analyses that examine the richness of individual experiences as well as the cumulative effects of environmental variables. The bi-directional nature of environmental and individual characteristics raises questions of causality, highlighting the importance of feedback loops, cascading effects and the endless interaction between levels of analysis. Researchers across fields recognise the challenges of understanding, measuring and evaluating the interplay between individuals and communities (Macintyre, Ellaway, & Cummins, 2002; Rappaport & Seidman, 2000; Sampson, Morenoff, & Gannon-Rowley, 2002; Subramanian, 2004; Subramanian, Jones, & Duncan, 2003).

The 'place effects' that were once considered a black box (Macintyre et al., 2002) may now be more clearly delineated with advances in analysis methods that do justice to the many layers of influence on individual lives. Statistical analyses are now better able to tease apart the differences between and within individuals and communities allowing us to examine the diversity within our samples rather than look solely at aggregated data (Subramanian, 2004). The increases in predictive power obtained permit an understanding of the richness of individuals and communities, and tests of the independent impact of risk and resilience factors.

Knowledge of core ingredients of resilience within the person shapes the agenda for insights at the community level, but awareness of ecological forces at work changes and extends the metaphor of recovery and sustainability to include relational constructs like leadership, reciprocity, and culture. With this greater understanding comes the 'opportunity for simultaneous pursuit of new knowledge and more effective practice' (Price & Behrens, 2003). The use of multi-level modeling permits us to better estimate the influence of community-level variables and examine variability both within and across communities, allowing us to inquire, for example, about the determinants of and influence from the average level of 'trust' within a neighbourhood, over and above the influence of the individual (Subramanian, Lochner, & Kawachi, 2003). Improved research design and analysis can aid in identifying the short- and long-term impacts, from behaviours and

Table 2. Trust across multiple levels of analysis.

Level of analysis	Sample constructs for evaluation	Types of research approaches
Biological Basis	Oxytocin	Experimental designs, lab assessments
Individuals	Interpersonal trust	Cross-sectional studies, daily diary studies
Families	Family cohesion, mutuality, and trust	Cross-sectional, family and genetic studies
Communities	Collaborative ties, reciprocity, fairness	Epidemiological/community samples, social indicator research

attitudes to the accumulated stress and environmental impact, of a neighbourhood on individual outcomes (Ellen, Mijanovich, & Dillman, 2001). These analyses provide the rich opportunity to look at different layers of effects over time and have been recognised by community researchers as an essential tool in carrying out macro-level research.

However, different levels of analysis often require attention to ecological influences, raising fundamental questions about the resilience process under study as well. The study of trust is a case in point (see Table 2). Trust is best understood at the level of the person, and his or her social interactions. However, it can also be examined at a biological level as a 'safety response' with physiological markers of parasympathetic activation, and with neurohormones like oxytocin, which has been associated with trusting others with personal resources (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005). Mutuality and cohesiveness characterise trusting family networks. At the level of community, this quality may be best characterised as collaborative ties, and fairness in the distribution of resources, and measured through indicators that can detect evidence of reciprocity in institutional relationships, neighbourhoods, and municipalities. Personal income is a valuable resource for resilience, but at the community level, high levels of income disparity among groups within the community (Wilkinson, 1996) may undermine processes of reciprocity and cooperation that permit the expression of trust in interactions among members of those groups, thereby weakening the psychological sense of community (Brodsky, O'Campo, & Aronson, 1999). Resilience researchers need to be mindful of the shifts in meaning of constructs like trust across levels of analysis. Measurement properties of the variable and how that variable is related to other key aspects of adaptation may change dramatically from the level of the person to that of community.

Studying resilience in action

Resilience concepts shift the focus of research on health and well-being through their emphasis on processes that aid in the restoration of well-being following stressful experiences. Stress reactivity research has correctly emphasised the need to examine responses close in time to the occurrence of the stressor (Linden, Rutledge, & Con, 1998; Lovallo & Gerin, 2003; Treiber et al., 2003). Only when the organism is challenged are its capacities fully tested and its vulnerabilities revealed (Light et al., 1999; Matthews, Woodall, & Allen, 1993). An important area of research concerns the identification of genes that promote resilience under stress. Caspi and colleagues (2003) reported that a functional polymorphism in the promoter region of the serotonin transporter gene protects individuals from depression following stressful life events. Young adults homozygous for the long allele had fewer depressive symptoms, diagnoses of depression and suicidality than individuals with one or two copies of the short allele. Some researchers ask whether

we can identify genetic factors in neural plasticity that can shape development of resilience (Curtis & Cicchetti, 2003), and whether we can identify factors that slow the effects of age on the decay of resilience (Hawkley et al., 2005).

A stress-diathesis approach that focuses solely on amplitude of the stress response is not sufficient, however. To fully estimate success of psychophysiological adaptation to stress, researchers need to assess both initial reaction and recovery (McEwen, 1998; Sapolsky, 1998). Frankenhauser (1983) has shown that heart rate increases during the workday at all occupational levels, but downregulates more rapidly afterwards for those in higher status occupations. A focus on resilience calls attention to the effect of time in the restoration of homeostasis. The failure to downregulate following a stress response and to restore homeostasis both physiologically and psychologically is the central contributor to allostatic load (McEwen, 1998; Seeman, Singer, Ryff, Dienberg Love, & Levy-Storms, 2002). To study resilience properly, we need to identify the critical factors within the person and their social situation that preserve health and well-being by promoting restoration of homeostasis.

Advanced field methods offer ways to study resilience processes as they unfold in everyday life. Electronic diaries may be used to monitor affects, cognitions and behaviours thought to be sources of resilience as well as those though to place the person at risk. These methods can be used to record resilient responses and also failures of resilience day to day. Ambulatory recording devices permit examination of physiological processes within days that may underlie recovery following stress as well (Almeida, 2005).

The resilience capacities of individuals and their families may be further tested through longitudinal research following major life crises. Bonanno (2005), for example, has developed a model of resilience built upon observations of how people respond to the loss of a loved one. Chronic burdens in family life pose special challenges to adaptive capacities. Most people have suffered through at least one highly stressful circumstance, and to understand resilience requires a careful assessment of the emotional, cognitive, and behaviour changes that facilitated their recoveries.

The interpersonal contributions to resilient outcomes are likely substantial. Most stressors are shared: Family and friends are involved, directly and indirectly, in the paths to recovery for people in crisis. Homelessness, divorce, chronic mental and physical illnesses are examples of situations that recruit whole families into them. To understand resilience requires us to advance our methods as well as our concepts to evaluate the capacities of families to rebound when faced with stressful circumstances. At the level of the individual, we may focus on a person's capacity for optimism, but at the family level, emotional leadership and a climate of acceptance may be the critical features that hold the families together during a crisis. Family interaction research can be used to characterise the behaviour of resilient families, and social climate measures can add an emotional profile.

Advances in neuroscience have permitted investigations of how family members exchange biological goods as well as social ones; reacting to and sharing experiences are revealed in changes in neurohormones, the heart and gut, as well as behaviour. Anxiety, hope, trust and attachment are shared qualities of families that are observable, in principal at least, at the level of genes, neurophysiology, behaviour, cognition and emotion. The dynamic changes in these family qualities in response to stress across levels and over time would be needed to capture resilience processes underway at home.

Communities also respond to a broad range of stressful events, some acute, others chronic disruptions. Some of these stressors, like discrimination based on income and race, lack of affordable housing and/or jobs for residents are deeply significant, yet often partially hidden or denied. Others are relatively straightforward: A road closure,

salmonella poisoning at the local elementary school, an acute shortage of gasoline. There can also be catastrophic threats to public health such as a terrorist threat aimed at the water supply, or the sustained failure of the electric power grid during hot summer months. The survival and well-being of individuals and their families depends not only on the resourcefulness of the people themselves, but also on the responsiveness of the community. Community responsiveness in turn can be impacted by deep and unresolved fissures of the type mentioned above.

As columnist Neal Peirce (2005) noted in his article about intergovernmental response to Hurricane Katrina, spending billions on recovery can be viewed as an enormous opportunity if the best minds are brought to the table to develop scenarios for public debate, if desirable community goals and visions are derived from this process, and if long-term, effective community-wide investments are made. These natural experiments may lead us to uncover the best ways to assess and strengthen community capacity.

Examining sustainability

Our second definition of resilience shifts our attention to those factors that preserve ongoing goal-related and highly valued activities that are key sources of psychological and/or physical well-being. Ecologists remind us that time is a central factor in sustainability. Some systems and societies survive well in the short term only to collapse later (Diamond, 2005). So too do some people appear unaffected by stressors, only to develop illness and emotional disturbance later. Most research examining the person's affective responses to stress focus on the extent of negative affects provoked. However, other outcomes may be more central to preservation of functioning long term: The degree to which positive engagements continue uninterrupted, the maintenance of broad affective range, and evidence of clear purposeful steps forward, unimpeded by stress, even if taken only one at a time (Ong et al., 2004). However, with some notable exceptions (e.g., Bonanno, 2004; Bonanno et al., 2002; Ong et al., 2004, 2006), studies of sustainability are rare when compared to the rich literature on stress and recovery.

The adoption of a *two-dimensional approach* allows us the conceptual space needed to develop methods of inquiry into the processes of sustainability of goals, purpose, and life satisfaction independent of the study of the negative affective reactions to stressful change. Although stressors may increase psychological distress, they may have little or no effect on how much hope the person sustains for the future, personal efficacy expectations, and trust in social relationships. Similarly, hope, efficacy and trust are also central to community health and at least partially independent of collective stress. In fact the role of crisis and disaster in forging positive public policy for the future is a frequent theme of the public policy literature (Vale & Campanella, 2005). A prominent American historian Kevin Rozario (2005) writes:

> Dominant colonial traditions encouraged a remarkably constructive approach to calamity, leading settlers on a constant search for silver linings. Disaster narratives became self-fulfilling prophecies, inspiring a faith in betterment, and generating the energy, will and capital commitment that made reconstruction viable – ultimately turning calamities into opportunities and thereby . . . making progress. (p. 34)

Communities have recently developed additional tools to use in building resilience while developing community. Substantial progress in collaborative leadership and community efforts to develop community-wide goals and indicators of progress towards those goals in a range of community domains can be observed in projects across the USA. The best of

these projects are inclusive longitudinal efforts that rest on the contributions of a diverse array of community stakeholders, institutions and sectors (e.g., Sustainable Seattle Regional Indicator Program http://www.sustainableseattle.org). These community efforts typically aim to enhance some combination of community social, educational, economic, physical, environmental, health and quality of life domains. As such, these projects are inherently geared to build connections among people and these central areas of community life, and promote studies that are inherently interdisciplinary. An interdisciplinary focus on resilience offers additional insight when examined at the level of neighbourhood and community.

Fostering resilience

When applying themes of resilience in the design of interventions, we sharpen the saw of current approaches, and also encourage new frameworks that take as their principal aim the development of personal and community resources. For individuals there are many useful prevention programmes, and many valuable therapies, but few interventions that have articulated a focus on resilience per se. Nevertheless, the skills and ingenuity of consulting and clinical practitioners have led to many methods that are likely to be proven highly successful in boosting individual capacity to recover from difficult times and sustain positive engagements.

One change is apparent with a focus on resilience: A shift away from exclusive attention on therapeutic methods and the endorsement of a broader scope of interactions designed to further strengthen existing talents. Alongside psychotherapy are a host of other potentially valuable interventions including 'coaching' (Hart, Blattner, & Leipsic, 2001), life course review (Viney, 1993), exercise, and mindful meditation, to name a few. Snyder (2002) advocated workshops to encourage pathways that strengthen the person's capacity for hope. With a resilience framework, the targets for lifting demoralisation are made more explicit. From a two-dimensional framework, we know, for instance, that restoring hope does not demand exclusive attention to alleviation of psychological distress. A person can be hopeful even when still anxious. Optimism can be urged even for those who cannot (or will not) give up their fundamentally pessimistic outlooks. Attention to emotion regulation that includes an embrace of the positive extends the metaphor of the therapeutic beyond that of coping and adjustment to include encouragement of feelings of joy, pleasure and exhilaration that come from pursuits of core values. Reich (2006) identified three core principles to follow in developing resilience interventions following catastrophic events: sense of control, coherence, and connectedness. There is broad applicability of these three 'C's' to which we might add a fourth: Culture. The social context as well as the interior of the mind shape what constitutes a positive experience and distinguishes it from that which is negative.

A number of interventions have been proposed in the last decade within the positive psychology framework. These interventions have focused specifically on fostering positive engagement with attention to constructs like 'flourishing' rather than psychopathology and the alleviation of distress. Another recent approach has been to encourage methods of 'forgiveness', thereby releasing restraints on the positive feelings that family members with a history of conflict may still have towards one another. In a large internet-based study of positive psychology interventions, Seligman and colleagues (Seligman, Steen, Park, & Peterson, 2005) found that when individuals wrote about three good things that happened each day and used their identified signature strengths in new ways each week, they had higher ratings of happiness and lower ratings of depression up to six months

post-intervention. These techniques are not new. Effective interventions for depression have often included positive activity 'homework' for those suffering from major depression (Lewinsohn & Graf, 1973). What is new is the paradigm; an attention to the positive for the explicit purpose of enhancing well-being and not as a salve for troubled states of mind. When seen with a two-dimensional lens, this approach is not simply compensatory or even rehabilitative in nature, but a means to further human development, along independent trajectories. Thus, the key to resilience is not only the capacity for calm, but the attainment of personal hopes and social purposes.

Communities

Resilience themes can be applied to the development of social and community interventions. Here, the focus is on furthering the expansion of social capital and strengthening connectivity by the reorganisation of social exchange. Individual capacity to learn, achieve, and excel at work is strengthened by organisational reforms that shift responsibility (and accountability) for complex tasks downward. Programmes in job enrichment (Herzberg, 1966), built upon an understanding of personal needs for mastery and growth on the job, can be highly beneficial to the company profits as well, building greater collective capacity as well as furthering the firm's social capital. These efforts are examples of effective resilience solutions in which personal development and organisational capacity are threaded together as a long-term investment strategy for a healthy and energetic organisation.

A broad systemic view of intervention is often not taken. For a host of reasons, interventions often 'morselize' (Lane, 1962) instead. They focus on narrow dimensions of 'the problem' and immediate achievable measures of outcomes such as quarterly profits or election validations rather than building system-wide capacity for the long term. This is particularly evident in the proliferation of community activities designed to help people cope with problems in living. Marginal tinkering with programmes, and minor investments in neighbourhoods, are unlikely to foster resilient communities. In fact, many limited and targeted grant efforts do just the opposite and reinforce separation and segregation, and in some cases even destroy communities (Chaskin et al., 2001; Churchill, 2003; Peirce, 2005).

Wildavsky (1988) explores the public policy implications of the fact that risk (danger) and safety are inextricably intertwined and should be viewed in a systems context. Wildavsky points to the danger of thinking in terms of 'all good' and 'all bad' and counsels a search for safety and development of the whole which involves reduction but not elimination of risk overall. In advocating resilience over resistance as a central organising theme for city planning and management, Churchill (2003) advises: 'conserving and investing in the human, social, intellectual and physical capital which constitutes its *protective factors*, rather than expending a large part of the energy of its leadership in short-term efforts' (p. 357).

Innovative resilience programmes can change the structure of social exchange within our communities. The 'Experience Corps' (Fried et al., 2004) is one example. This programme engages retired senior citizens to advance the chances of young children within inner-city schools. The seniors are provided a way to participate meaningfully in bettering the lives of children in their community. In turn, the children have a surrogate, caring grandparent who watches over them during part of the school day. Success is measured by markers of well-being among the seniors as well as retention rates of the children in high school.

St. Luke's Health Initiatives, an Arizona Community Foundation, has launched a five-year, multi-million dollar programme that blends the authors' resilience model together with strength-based community development as a key to resilience (Kretzman & McKnight, 1993). Called 'Health in a New Key (HNK)', this intervention awards community organisations that develop new partnerships to implement resilience-based interventions that focus on assets, not deficits. The effort is defined as 'a way of identifying, framing and responding to issues that focuses first on existing strengths and assets ... and avoids the pervasive culture and model of deficits and needs' ('HNK', 2006). This initiative marks an important step in providing funds to move beyond threat and response paradigms to funding resilience and assets-based research and interventions that can be sustained within communities.

HNK is based on a redefinition of health and measures of progress in that domain. According to the designers of HNK, in the traditional definition of health ('health in the standard key'): 'Health proceeds through diagnosis and treatment based on science, evidence and best practices. Illness, pathology, needs and deficiencies are identified. Treatment and services are provided. Patients and communities are "restored to health" ' (St. Luke's Health Initiatives, 2008a). Juxtaposed to this definition is Health in the New Key: 'Health is the harmonious integration of mind, body and spirit within a responsive community. Diagnosis and treatment, yes, but the focus shifts to strengths and assets first, not just deficits' (St. Luke's Health Initiatives, 2008a). By providing financial support in the form of nine five-year partnership grants to collaborations of public and private non-profit organisations throughout the vast Phoenix metropolitan areas, St. Luke's Health Initiatives hopes to promote resilience and better community health by nurturing existing organisations, instilling a new approach to health in the region and developing 'stronger and more pervasive formal/informal community networks focused on improving health outcomes' (St. Luke's Health Initiatives, 2008a).

Examples from current funded partnerships include collaborative efforts designed to foster broad goals of community building and resilience while meeting important targeted objectives such as:

1. develop a sustainable asset mobilisation process that improves community health status;
2. increase the number of Phoenix Hispanic families willing and able to provide foster and/or adoptive homes for Hispanic children;
3. identify *promotoras* to serve as leaders addressing community health priorities to measurably improve maternal and infant outcomes in South Phoenix and Maryvale (Phoenix communities with large poverty populations) (St. Luke's Health Initiatives, 2008b).

Other examples include the Healthy Communities Initiatives by the World Health Organization (World Health Organization [WHO], 1997), as well as the National Civic League's All-American Cities awards and its development of the Civic Index (National Civic League, 1999). The Resilience Alliance is an international network of institutions and agencies that focuses on social–ecological systems, promoting adaptability and sustainability surrounding developmental policy and practice. The Community Resilience Project based in British Columbia has developed manuals and guides to enhance the capacity of individuals and communities in responding to change. These programmes and many more represent a new era of public policy and programming that attends to both the needs and the deficits within our communities. Future efforts must strive to continue to unify theory

and integrate social activism with models of health and well-being built upon a solid empirical foundation.

Resilience: more than a metaphor

Resilience has become a powerful metaphor for human endurance in a wide array of literature, ranging from scholarly articles about ecology and urban affairs, to the financial and sports pages of the daily newspaper. We hope we have shown that there is now substantial if not universal evidence of its paradigm-building strength among social scientists interested in models of health and well-being across the life span. As metaphor, resilience exerts a powerful influence on how we think about physical health and psychological well-being. In this paper, our aim has been to develop resilience as more than a metaphor by providing guidance to scientific inquiry. We have advocated measurement methods, multi-level designs, and a two-dimensional approach to modeling health and well-being for individuals and their communities. In our view, only by gathering longitudinal data in studies of the turning points in the life course, along with contemporaneous assessments of everyday life, and conducing controlled laboratory studies that provoke challenges to adaptation will we begin to specify the mechanisms that underlie resilience. By establishing urban observatories to mark progress along dimensions of resilience for collectivities and testing the efficacy of interventions that seek to strengthen resilience for people and their social worlds, we may arrive at the point to declare, as Edward Jenner (1801) did with the smallpox vaccine, that the evidence favouring this approach to health was 'too manifest to admit of controversy'. Meanwhile, there will be plenty of criticism of resilience concepts, and much healthy debate about measures, and methods of change. In science, that is as it should be.

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Note

1. To develop specific answers to these questions, The Resilience Solutions Group of Arizona State University (www.asu.edu/resilience) has begun a comprehensive five-year study of residents of forty diverse 'social worlds' in greater Phoenix, Arizona. The results from that study and related research may provide empirical evidence to support a community resilience index and a menu of most effective options for building resilience in communities.

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