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The Burden of Disaster: Part I. Challenges and Opportunities Within a Child's Social Ecology

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Abstract

Child development and adaptation are best understood as biological and psychological individual processes occurring within the context of interconnecting groups, systems, and communities which, along with family, constitute the child's social ecology. This first of two articles describes the challenges and opportunities within a child's social ecology, consisting of Micro-, Meso-, Exo-, and Macrosystems. The parent-child relationship, the most salient Microsystem influence in children's lives, plays an influential role in children's reactions to and recovery from disasters. Children, parents, and other adults participate in Mesosystem activities at schools and faith-based organizations. The Exosystem—including workplaces, spcial agencies, neighborhood, and mass media—directly affects important adults in children's lives. The Macrosystem affects disaster response and recovery indirectly through intangible cultural, social, economic, and political structures and processes. Children's responses to adversity occur in the context of these dynamically interconnected and interdependent nested environments, all of which endure the burden of disaster. Increased understanding of the influences of and the relationships between key components contributes to recovery and rebuilding efforts, limiting disruption to the child and his or her social ecology. A companion article (R. L. Pfefferbaum et al., in press) describes interventions across the child's social ecology.

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Keywords

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Research has established children's vulnerability to disasters and has begun to elucidate the myriad factors that influence their reactions in the near- and long-term (e.g., Norris et al., 2002; Silverman & La Greca, 2002). In fact, nearly 30 years of research have identified an abundance of individual, family, and social factors that are potentially linked to children's disaster outcomes. Unfortunately, large gaps remain in what we know about the relative influence of each factor and the course of disaster-related reactions in children. These knowledge gaps undermine the advancement of theory and impede the development of effective services for children and their families.

Child development and adaptation are best understood in the context of the interconnecting groups, systems, and communities which, along with family, constitute the child's social ecology. As articulated by Waller (2001), development and adaptation do not exist in a vacuum; rather, the social environment significantly influences children's risk for maladjustment as well as their propensity for recovery and resilience. The child's most immediate context is that of the family, but children belong to numerous and diverse groups, systems, and communities that interact with each other to influence development and adaptation in general and with respect to disasters.

The vast social ecology encompassing individuals, families, systems, and communities is characterized by both structural and functional properties, which are especially relevant when considering the impact of a disaster on the child. Structural components of the child's disaster social ecology include the child (e.g., demographics, biology, temperament, coping, prior trauma), family (e.g., demographics, structure, socioeconomic status), school, other adults, neighborhoods, religious organizations, community programs, peer groups and programs, health and mental health care, social services, public resources, social policy, economics, the media, politics, and emergency management. Functional components of the child's disaster social ecology include the disruption (e.g., loss, harm), responsiveness, communication, cohesion, support, access and barriers to resources (including services), trust, and time. To varying degrees, disasters disrupt these structures and functions.

In this article, we review the social ecology of child development and describe children's disaster reactions from this perspective. Enhanced understanding of the nature and course of children's disaster reactions requires further exploration of the environments composing their social ecology – family, school, neighborhood, community, and larger society – all of which may be affected by disaster. The interplay among these nested environments within the social ecology is active and interactive, with the component parts responding and adjusting across tragedies and triumphs. A companion article (R. L. Pfefferbaum et al., in press) describes interventions across the child's social ecology.

Child Development in a Social Ecological Context

Biological and cognitive maturation are dynamic intra-individual processes underlying child development. As bio-psychosocial beings, children's development occurs within, and is influenced by, these biologically-informed internal processes as well as by the transactions occurring between children and the cultural, economic, and societal forces that surround them. Urie Bronfenbrenner (Bronfenbrenner & Morris, 2006) has illustrated the child's developmental ecology in his Bioecological Model, an explanatory and theoretical framework explicating the impact of social attachments that extend across the child's social ecology, providing distinct types of support and guidance throughout the developmental

process and creating a foundation for coping with a variety of life challenges. When threatened by a disaster or other trauma, the child depends on these attachments, beginning with the parent-child relationship and extending outward in the Bioecological Model toward social bonds with others at the community and societal level (Charuvastra & Cloitre, 2008). Despite being criticized for its over-inclusiveness, complexity, and insufficient emphasis on biological and cognitive factors, we chose this model because it focuses on the interrelated social elements existing within and impacting a child's development and post-disaster adaptation. Using Bronfenbrenner's approach as a foundation, we propose a dynamic model to depict the structure of children's social ecology, the interdependent relationships that exist among all nested environments, and the presence of the ecological components within a changing physical world.

The individual exists at the center of the social ecological system to account for the profound influence of children's unique and personal biological, cognitive, and emotional processes. Children bring their own biological and psychological processes and past experiences, emphasized in later formulations of Bronfenbrenner's Bioecological Model, and including genetics, temperament, intelligence, family history, emotional development, coping, exposure to prior traumas, pre-existing and comorbid conditions, behavioral, and cognitive patterns, and other intra-individual factors, to their disaster experiences. We selected the Bioecological Model, which incorporates the biopsychological components of the individual child, but specifically emphasizes the individuals, groups, systems, and communities surrounding and sustaining children, because the entire social ecological system is challenged over time with the burden of disaster.

The first layer encompassing the child and the setting in which he or she lives is the Microsystem. Within Microsystems are the individuals and groups with whom the child interacts directly and on a regular basis including, for example, parents, close friends, role models, and teachers (Bronfenbrenner & Morris, 2006). Children are dependent upon these important others to meet their basic everyday needs and to prepare for and respond to disasters.

The next layer of the social ecology is the Mesosystem, a functional component that involves connections between two or more Microsystems (Bronfenbrenner & Morris, 2006). While the developing child is the primary link between the settings, social networks extending from the child outward across and among parents, close friends, teachers, and mentors represent the active and dynamic Mesosystem. Mesosystem networks operate through four pathways, any of which may be affected and activated by a disaster: social support, social influence, social engagement and attachment, and access to resources and materials (Berkman & Glass, 2000).

The Exosystem is the third layer of the child's social ecology that includes various institutions, structures, networks, and processes including state and federal agencies, transportation systems, and communication channels (Riley & Masten, 2005). The Exosystem incorporates links between the child's immediate environment and the social settings in which the child does not have an active role, indirectly affecting development by acting on the child's Micro- and Mesosystems. It is characterized by the family's degree of social integration with the neighborhood and community through ties with other families or participation in the workplace, government, and informal social networks (Bronfenbrenner & Morris, 2006). Disasters place immense burden on the Exosystem, often disrupting its essential components and functions.

The Macrosystem is the outermost layer of a child's social ecology. It includes cultural and subcultural sources of ideology and information (e.g., economic, political, educational,

legal) that underlie the other systems in the model (Bronfenbrenner, 1977). Macrosystems may be identified by "social address labels" that describe culture and subculture contexts including socioeconomic status, ethnicity, and region (e.g., rural, urban, suburban; Bronfenbrenner, 2005). Components within the Macrosystem indirectly impart social support through pre-existing social, economic, and political structures and processes and may have different effects on children and their families, living in the same community. Each component is both vulnerable to disaster and necessary for collective response and recovery.

Dynamic Social Attachments within the Social Ecology

The composition of a child's social environment changes with the child's development, and the relative importance of various systems in a child's social ecology, particularly when major events occur, depends in part on developmental timing. For example, family and early experiences are the primary influences on infants and young children; family, peers, and school environments exert key influence during childhood; and work, religion, and social and community forces are more important later (Cowen, 1994). The child's social ecology increases in complexity with the increasing number and importance of these systems. Moreover, time and physical space boundaries that once existed between various components of the social ecology have decreased with the ever-increasing use of technology, altering interactions between individuals and systems within the ecology (Stokols, Misra, Runnerstrom, & Hipp, 2009).

Trauma and Disaster: Effect on the Social Ecology

Researchers have recognized that Bronfenbrenner's Bioecological Model provides a useful framework for depicting the diverse processes that influence a child's reactions and adjustment trajectory after a major trauma (Edwards, 1998; Kilmer & Gil-Rivas, 2008; Weems & Overstreet, 2008). Weems and Overstreet (2008) outlined the various influences on children's disaster adjustment in the specific context of Hurricane Katrina, including Macrosystem (e.g., prejudice, discrimination, lack of social support), Exosystem (e.g., workplace), Mesosystem (e.g., peer groups), and Microsystem (e.g., parental mental health) factors, all of which positively or negatively affect disaster recovery.

Empirical research and clinical experience have provided a wealth of information on children's reactions to disasters and the developmental and contextual factors that influence their reactions, which include (1) the physical environment where the disaster occurs and the risks within that environment (e.g., geographic location, hazard risks); (2) aspects of the disaster itself (e.g., predictability, intensity, duration); (3) the nature and degree of the child's disaster exposure (e.g., physical proximity, injury, relationship to victims) and peri-event reactions (e.g., subjective appraisal of danger and life threat); (4) the child's inherent characteristics (e.g., age, gender, race/ethnicity, temperament, coping, pre-existing conditions, prior trauma); (5) the family atmosphere (e.g., parent reactions, quality of relationships and interactions); and (6) the social environment—both pre- (e.g., socioeconomic status, social support) and post- (e.g., disruption and chaos, secondary adversities, social support) disaster (Harvey, 1996; Hoge, Austin, & Pollack, 2007; Shaw, Espinel, & Shultz, 2007; Silverman & LaGreca, 2002).

Despite its theoretical relevance for delineating the processes affecting children's post-trauma trajectories, research related to social influences (outside of the parent-child relationship) is relatively rare. There is even less understanding about how these influences operate in the disaster context. Anchored in the structure of the social ecology's nested environments, children experience a diversity of reactions to disaster. We provide an overview of existing research findings relevant to children's short- and long-term disaster

mental health outcomes, utilizing the social ecology model as an organizing paradigm. Thus, the text below constitutes a summary of the processes and mechanisms occurring within each nested environment in the disaster context.

Disaster and the Micro- and Mesosystems

Microsystem

Existing as a protective shield, parents and the family serve as the primary source of support to children in the Microsystem. In a disaster recovery environment, family members offer social support; they contribute to the formation or exacerbation of negative outcomes; and they serve as models of effective or ineffective coping (Compas & Epping, 1993). Parents, as the gatekeepers for their children's entry into the health care system, also provide accounts of their children's symptoms and functioning, particularly for young children. Research findings generally support the existence of these family roles and indicate that parental responses influence their children's psychosocial functioning and coping in the aftermath of a disaster (Compas & Epping, 1993; Norris et al., 2002). In fact, in their 20-year review of disaster research, Norris and colleagues (2002) concluded that parental stress is among the robust predictors of children's distress following disasters.

Parent and child disaster reactions—Burdened by the trauma and devastation caused by disaster, children and their parents may be greatly affected, with normal family routines and supports disrupted as the family attempts to cope. The quality of children's disaster reactions may differ from those of adults, but they generally parallel those of their parents in degree (e.g., Breton, Valla, & Lambert, 1993; Earls, Smith, Reich, & Jung, 1988; Green et al., 1991). While this may reflect, in part, similar exposure, parental interpretations and emotional reactions may provide a measure of the seriousness of the event for their children (Deering, 2000) as supported by research documenting positive relationships between children's post-disaster adjustment and parental disaster reactions (e.g., Breton, et al., 1993; Earls et al., 1988; Fairbrother, Stuber, Galea, Fleischman, & Pfefferbaum, 2003; Gil-Rivas, Silver, Holman, McIntosh, & Poulin, 2007).

Several complicating factors emerge when examining the association between parent/family and child functioning in the post-disaster recovery environment. Parental reports may not represent accurate portrayals of their children's reactions because parents may not have the psychological or emotional means to assist their children; they may underestimate or overlook the support children require (Belter & Shannon, 1993; Silverman & La Greca, 2002). Nonetheless, contrary to some studies suggesting that parental symptoms and parental dysfunction create risk for children (Green et al., 1991; Laor et al., 1997; McFarlane, 1987b), results from other studies lend support to a causal relationship in which children's distress influences their parents' posttraumatic symptoms (Koplewicz et al., 2002; Mirzamani & Bolton, 2002).

The parent-child relationship may be particularly vulnerable to the burden of disaster, especially with respect to maternal reactions (Green et al., 1991; Winje & Ulvik, 1998) and the reactions of younger children (Laor et al., 1997; Laor, Wolmer, & Cohen, 2001; Wolmer, Laor, Gershon, Mayes, & Cohen, 2000), reflecting the traditionally prominent role of mothers in child-rearing, the relatively greater time mothers usually spend with children, and the greater autonomy of children as they develop and mature (Wolmer et al., 2000). Results from an early disaster study of children and parents exposed to an Australian bushfire demonstrated that enduring maternal distress and subsequent changes in parenting predicted children's persisting distress, even more so than children's direct exposure to the disaster (McFarlane, 1987a). Swenson and colleagues (1996) found that maternal distress and mothers' experiences of additional life stressors (e.g., marriage, death, loss of property)

were associated with behavioral problems in preschoolers following Hurricane Hugo. Undoubtedly, the parent-child relationship represents the most salient Microsystem influence in children's lives and plays an influential role in their reactions to and recovery from disasters.

Pre-disaster parent and child influences—There is a dearth of information about the influence of pre-disaster parent and child functioning on children's adjustment to disasters. Endo and colleagues (2007) demonstrated a link between retrospective parental ratings of their own pre-disaster mental health and their children's posttraumatic stress symptoms in response to the Niigata-Chuetsu earthquake in Japan. Conversely, in a Hurricane Katrina study with preschool children and their caregivers, parents' development of Katrina-related posttraumatic stress disorder (PTSD) symptoms, and not preexisting parental symptoms (of anxiety disorders, depression, and/or alcohol abuse), was associated with the development of posttraumatic stress symptoms in their children (Scheer-inga & Zeanah, 2008).

Family changes post disaster—In general, families are characterized by relationships; by their structure, roles, and boundaries; by emotional bonds and responsiveness; by cohesiveness, flexibility, adaptability, and coping; by communication; and by decision making and problem solving (Moos & Moos, 1976). Effects of disasters on families are evidenced in socio-behavioral outcomes and changes in relationships that result in modifications within the Microsystem that resonate throughout the other systems in a child's social ecology. The effects of disasters on families may be evidenced by disruptions in family relationships.

Empirical evidence indicates that marital stress (Norris & Uhl, 1993) and domestic violence (Adams & Adams, 1984) may increase following disasters, but so may family solidarity, measured for example as decreased divorce rates (Nakonezny, Reddick, & Rodgers, 2004) and increased births rates (Rodgers, St. John, & Coleman, 2005). Cohan and Cole (2002) found higher marriage and birth rates and also higher divorce rates in counties affected by Hurricane Hugo compared to unaffected counties, suggesting that people may take actions in their close relationships post-disaster that affect their subsequent life course.

As a central component of children's Microsystems, interactions among family members and their collective reactions appear to influence children's post-disaster adjustment (Bokszczanin, 2008; Fairbrother et al., 2003; Laor et al., 1996; Laor et al., 1997; Laor et al., 2001; McFarlane, 1987b), though research in this area is scant. Results of one study demonstrated family cohesion (the flexibility of emotional bonds among family members), rather than adaptability (the capacity to adjust the power structure, roles, and norms within the family), was the primary determinant of Israeli children's ability to withstand the stress of SCUD missile attacks in the 1990–1991 Persian Gulf War (Laor et al., 1996). Child adjustment problems were associated with both too much and too little cohesion—suggesting that both disengaged families (which fail to help the child process the experience) and enmeshed families (which transmit unmodified negative emotions from one family member to another) may put children at risk (Laor et al., 2001; Laor et al., 1996). Other family characteristics or patterns of response have been linked to children's disaster reactions, including irritability and/or depression (Green et al., 1991), parental stress and conflict (Handford et al., 1986; Wasserstein & La Greca, 1998), conflict between adolescents and their parents (Gil-Rivas, Holman, & Silver, 2004), and even parental overprotectiveness (Bokszczanin, 2008).

Importantly, the family influences, and is influenced by, structures and systems existing throughout the neighborhood, community, national, and global environments comprising the greater social ecology. Scaramella and colleagues (2008) demonstrated relationships between family financial strain and neighborhood violence, parental distress, decreased

parenting efficacy, and child behavior problems (regardless-of age or family income level). Unfortunately, the family and community adversities that existed for participating families prior to Hurricane Katrina precluded these researchers from drawing any conclusions about the impact of the disaster on their Family Stress Model. Thus, more research is needed to substantiate causal links between community adversity at the Exosystem level, parental distress, and child symptoms; to more fully understand the nature of family effects; and to explore alterations in family dynamics post disaster.

The role of peers—The intimate bonds children create with their friends represent an important component of the Microsystem. Disasters disrupt routines and leisure activities in which children spend time with friends and interact with peers. Children are usually able to maintain access to friends and peers at school because schools tend to reopen quickly after a disaster, and as a result, classmates and peers may function as reflections of children's own reactions to the collective trauma (Jaycox, Morse, Tanielian, & Stein, 2006). Terranova, Boxer, and Morris (2009) examined posttraumatic stress symptoms among adolescent survivors of Hurricane Katrina and found that exposure, initial posttraumatic stress symptoms, and negative peer interaction ("peer victimization") predicted long-term symptoms. Only negative peer relations exerted an effect; prosocial peer support was not related to long-term recovery. Nested within a social community, friends and peers provide children with an important social Microsystem to which they belong. Unfortunately, knowledge about their role in children's disaster reactions is limited.

Mesosystem

Key entities within the Microsystem interact with each other to contribute to the child's development within the Mesosystem. The child exists as the primary entity linking the various Microsystem settings (e.g., home, school). Interactions between teachers and other school personnel, parents, and children represent the functional role of the Mesosystem in the social ecology. Dense Mesosystems contain numerous and diverse links among home, school, peer group, faith-based organizations, and neighborhood; limited connections result in weak Mesosystems and increased risk for the child (Garbarino & Ganzel, 2000).

Disaster and the Exo- and Macrosystems

Exosystem

Disasters affect the Exosystem by influencing the important connections between individuals in a child's immediate environment (e.g., parents, teachers) and social settings in which the child does not actively participate (e.g., parental work and social environments, neighborhood and community organizations, mass media, government, other informal social networks). Government, parental employment, social agencies, neighborhood, community organizations, and mass media directly affect parents and other important adults in children's lives (e.g., teachers), who in turn directly affect the child. For example, the government delivers disaster relief and disaster mental health services often through existing social agencies. The degree of adults' exposure to, and participation in, these systems and processes within the Exosystem affects their own disaster reactions and thus, their children's responses. The media provide risk communication through public health recommendations (e.g., for vaccinations) and directives (e.g., evacuation orders), but disaster coverage also may be associated with potentially negative effects (Fairbrother et al., 2003; Kennedy, Charlesworth, & Chen, 2004; B. Pfefferbaum et al., 2003).

In addition to direct effects on children, severe disasters like Hurricane Katrina also affect children indirectly through the Exosystem. One year after Hurricane Katrina, the Kaiser Family Foundation (2007) conducted a comprehensive survey of residents of the greater

New Orleans area. The results revealed devastating consequences for many families: 52% reported a worsened financial situation after Hurricane Katrina; 37% experienced significant housing or social network disruption; 49% had health care coverage and access problems; and 17% suffered unemployment or decrease in pay or benefits. Supportive and nurturing connections with the community help parents and other adults achieve goals and address the needs of children following disaster. This support may be provided by outreach or clinical services for parents that assist with locating, acquiring, and equitably distributing needed resources.

The persistence of clinical symptoms in reaction to disaster-related secondary adversities may prolong psycho-pathology beyond the initial trauma. Studying the effects of Hurricane Andrew, Shaw and colleagues (1996) linked enduring posttraumatic stress symptoms to the secondary stressors affecting children and families. They attributed children's high levels of enduring posttraumatic stress and behavioral disruption at 21 months post-disaster to the displacement, increased unemployment, and loss of utilities and other infrastructure damage occurring throughout the community (Shaw, Applegate, & Schorr, 1996). Importantly, however, children who recover completely from prior trauma may demonstrate better outcomes when faced with a future traumatic event (Silverman & La Greca, 2002).

Macrosystem

An increasingly dangerous world contributes to, and is influenced by, disasters. Furthermore, recent global changes in technology, geophysical environments (e.g., climate, pollution, resource depletion), and increasing diversity and conflict among sociopolitical interests affect the structure and functioning of individuals' social ecological systems (Stokols et al., 2009). The Macrosystem of a child's social ecology is most directly affected by these alterations in cultural and subcultural values and processes in relation to disaster. Disruption at the Macrosystem level indirectly affects disaster response and recovery through intangible cultural, social, economic, and political structures and processes, perhaps stifling progress and healing in the recovery environment. For children, families, and communities, extreme events like the 2004 Indian Ocean tsunami and Hurricanes Katrina and Ike altered perspectives of mass disasters due to the devastating changes in the social ecology that remained.

In well-developed Western countries, other factors have affected the Macrosystem at a societal level including a decaying infrastructure (e.g., unsafe bridges, dams, levees) and demoralization brought by diminished trust in government. National and local responses to Three Mile Island (Goldsteen, Goldsteen, & Schorr, 1992) and Katrina (Quinn, 2006), for example, undermined trust in the public infrastructure that is designed to sustain communities, groups, and individuals. The foundation of support for a child's social ecology is further eroded by the failure of the system to render aid, especially when things are most dire.

Race, Culture, and Social Groups

A body of literature is emerging regarding the Macrosystem influences of racial, cultural, and social group membership and affiliation on disaster outcomes, although most of the existing research is limited to adult studies. Early disaster studies reported inconsistent results regarding racial and ethnic differences among children exposed to disasters. While some child disaster studies identified comparable reactions across racial groups (e.g., Garrison et al., 1995; Shaw et al., 1995; Vernberg, La Greca, Silverman, & Prinstein, 1996), others have supported minority racial status as a risk factor for child disaster survivors (e.g., La Greca, Silverman, Vernberg, & Prinstein, 1996; Russoniello et al., 2002; Shannon, Lonigan, Finch, & Taylor, 1994; Terranova et al., 2009). Unfortunately, most results

concerning racial, cultural, or ethnic differences obscure any influence of ethnicity on outcomes by failing to adequately address broader social and cultural issues.

Conclusion

The destructive nature of disasters can cause irrevocable harm and devastation to children and the individuals, groups, systems, communities, and processes that comprise children's social ecology. The literature has provided a wealth of information documenting the deleterious effects of disasters on children; however, the extent to which the burden of disaster impacts the broader social ecological context to which children belong is often overlooked. Further research is needed to elucidate the various structures and functions existing within a child's Micro-, Meso-, Exo-, and Macrosystems that affect their disaster reactions.

Parents, extended family members, peers, teachers, and others with whom children share intimate bonds contribute to their disaster adjustment and often provide essential support in the post-disaster environment. Strong connections among home, school, peer group, faith-based organizations, neighborhoods, and supportive networks and responses within social, community, and governmental agencies, can foster children's resilience and recovery in the face of adversity. The Bioecological Model represents the multitude of factors impacting the ability of a child to recover or grow in response to disaster. Ideally, the nested environments surrounding children are able to mitigate the effects of disasters and to foster recovery and rebuilding efforts that limit disruption to the child and his or her social ecology. While our understanding of the mechanisms by which each social ecological component influences the other is developing, it is clear that children will benefit from efforts to bolster the ecology's ability to provide support and protection in preparation for and response to disasters. A companion article (R. L. Pfefferbaum et al., in press) describes the use of the social ecological framework to provide mental health interventions.

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References

Adams PR, Adams GR. Mount Saint Helen's ashfall: Evidence for a disaster stress reaction. American Psychologist. 1984; 39(3):252–260.10.1037//0003-066X.39.3.252 [PubMed: 6711993]

Belter, RW.; Shannon, MP. Impact of natural disasters on children and families. In: Saylor, CF., editor. Children and disasters. New York: Plenum Press; 1993. p. 85-103.

Berkman, LF.; Glass, T. Social integration, social networks, social support, and health. In: Berkman, LF.; Kawachi, I., editors. Social epidemiology. New York: Oxford University Press; 2000. p. 137-173.

Bokszczanin A. Parental support, family conflict, and overprotectiveness: Predicting PTSD symptom levels of adolescents 28 months after a natural disaster. Anxiety, Stress & Coping. 2008; 27(4):325–335.10.1080/10615800801950584

Breton JJ, Valla JP, Lambert J. Industrial disaster and mental health of children and their parents. Journal of the American Academy of Child and Adolescent Psychiatry. 1993; 32(2):438–445.10.1097/00004583-199303000-00028 [PubMed: 8444776]

Bronfenbrenner U. Toward an experimental ecology of human development. American Psychologist. 1977; 32(7):513–531.

Bronfenbrenner, U. Ecological systems theory. In: Bronfenbrenner, U., editor. Making human beings human: Biological perspectives on human development. Thousand Oaks, CA: Sage Publications; 2005. p. 106-173.

Bronfenbrenner, U.; Morris, PA. The bioecological model of human development. In: Damon, W.; Lerner, RM., editors. Handbook of child psychology. 6. Vol. 1. New York: John Wiley & Sons, Inc; 2006. p. 793-828.Theoretical models of human development

Charuvastra A, Cloitre M. Social bonds and PTSD. Annual Review of Psychology. 2008; 59:301–328.10.1146/annurev.psych.58.110405.085650

Cohan CL, Cole SW. Life course transitions and natural disaster: Marriage, birth, and divorce following Hurricane Hugo. Journal of Family Psychology. 2002; 16(1):14–25.10.1037/0893-3200.16.1.14 [PubMed: 11915406]

Compas, BE.; Epping, JE. Stress and coping in children and families: Implications for children coping with disaster. In: Saylor, CF., editor. Children and disasters. New York: Plenum Press; 1993. p. 11-28.

Cowen EL. The enhancement of psychological wellness: Challenges and opportunities. American Journal of Community Psychology. 1994; 22(2):149–179. [PubMed: 7977176]

Deering CG. A cognitive developmental approach to understanding how children cope with disasters. Journal of Child and Adolescent Psychiatric Nursing. 2000; 13(1):7–16.10.1111/j.l744-6171.2000.tb00070.x [PubMed: 11022467]

Earls F, Smith E, Reich W, Jung KG. Investigating psychopathological consequences of a disaster in children: A pilot study incorporating a structured diagnostic interview. Journal of the American Academy of Child & Adolescent Psychiatry. 1988; 27(1):90–95.10.1097/00004583-198801000-00014 [PubMed: 3343213]

Edwards MLK. An interdisciplinary perspective on disasters and stress: The promise of an ecological framework. Sociological Forum. 1998; 13(1):115–132.

Endo T, Shioiri T, Toyabe S, Akazawa K, Someya T. Parental mental health affects behavioral changes in children following a devastating disaster: A community survey after the 2004 Niigata-Chuetsu earthquake. General Hospital Psychiatry. 2007; 29(2):175–176.10.1016/j.genhosppsych.2006.09.006 [PubMed: 17336669]

Fairbrother G, Stuber J, Galea S, Fleischman AR, Pfefferbaum B. Posttraumatic stress reactions in New York City children after the September 11, 2001, terrorist attacks. Ambulatory Pediatrics. 2003; 3(6):304–311.10.1367/1539-4409(2003)003<0304:PSRINY>2.0.CO;2 [PubMed: 14616045]

Garbarino, J.; Ganzel, B. The human ecology of early risk. In: Shonkoff, JP.; Meisels, SJ., editors. Handbook of early childhood intervention. 2. London: Cambridge University Press; 2000. p. 76-93.

Garrison CZ, Bryant ES, Addy CL, Spurrier PG, Freedy JR, Kilpatrick DG. Posttraumatic stress disorder in adolescents after Hurricane Andrew. Journal of the American Academy of Child and Adolescent Psychiatry. 1995; 34(9):1193–1201.10.1097/00004583-199509000-00017 [PubMed: 7559314]

Gil-Rivas V, Holman EA, Silver RC. Adolescent vulnerability following the September 11th terrorist attacks: A study of parents and their children. Applied Developmental Science. 2004; 8(3):130–142.

Gil-Rivas V, Silver RC, Holman EA, McIntosh DN, Poulin M. Parental response and adolescent adjustment to the September 11, 2001 terrorist attacks. Journal of Traumatic Stress. 2007; 20(6):1063–1068.10.1002/jts.20277 [PubMed: 18157889]

Goldsteen RL, Goldsteen K, Schorr JK. Trust and its relationship to psychological distress: The case of Three Mile Island. Political Psychology. 1992; 13(4):693–707.

Green BL, Korol M, Grace MC, Vary MG, Leonard AC, Gleser GC, Smitson-Cohen S. Children and disaster: Age, gender, and parental effects on PTSD symptoms. Journal of the American Academy of Child & Adolescent Psychiatry. 1991; 30(6):945–951.10.1097/00004583-199111000-00012 [PubMed: 1757444]

Handford HA, Mayes SD, Mattison RE, Humphrey FJ, Bagnato S, Bixler EO, Kayles JD. Child and parent reaction to the Three Mile Island nuclear accident. Journal of the American Academy of Child Psychiatry. 1986; 25(3):346–356.10.1016/S0002-7138(09)60256-9

Harvey MR. An ecological view of psychological trauma and trauma review. Journal of Traumatic Stress. 1996; 9(1):3–23. [PubMed: 8750448]

Hoge EA, Austin ED, Pollack MH. Resilience: Research evidence and conceptual considerations for posttraumatic stress disorder. Depression and Anxiety. 2007; 24:139–152. [PubMed: 16892420]

Jaycox, LH.; Morse, LK.; Tanielian, T.; Stein, BD. How schools can help students recover from traumatic experiences: A tool kit for supporting long-term recovery. Rand Corporation Gulf States Policy Institute TR-413-RC. 2006. Retrieved from http://www.rand.org/content/dam/rand/pubs/technical_reports/2006/RAND_TR413.pdf

Kaiser Family Foundation. Giving voice to the people of New Orleans: The Kaiser post-Katrina baseline survey (Publication #7631). Menlo Park, CA: The Henry J. Kaiser Family Foundation; 2007. Retrieved from http://www.kff.org/kaiserpolls/upload/7631.pdf

Kennedy C, Charlesworth A, Chen JL. Disaster at a distance: Impact of 9.11.01 televised news coverage on mothers' and children's health. Journal of Pediatric Nursing. 2004; 19(5):329–339. [PubMed: 15614257]

Kilmer RP, Gil-Rivas V. Posttraumatic growth in youth following disasters. The Prevention Researcher. 2008; 15(3):18–20.

Koplewicz HS, Vogel JM, Solanto MV, Morrissey RF, Alonso CM, Abikoff H, Novick RM. Child and parent response to the 1993 World Trade Center bombing. Journal of Traumatic Stress. 2002; 15(1):77–85. [PubMed: 11936725]

La Greca AM, Silverman WK, Vernberg EM, Prinstein MJ. Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. Journal of Consulting and Clinical Psychology. 1996; 64(4):712–723.10.1037/0022-006X.64.4.712 [PubMed: 8803361]

Laor N, Wolmer L, Cohen DJ. Mothers' functioning and children's symptoms 5 years after a SCUD missile attack. American Journal of Psychiatry. 2001; 158:1020–1026. [PubMed: 11431222]

Laor N, Wolmer L, Mayes LC, Gershon A, Weizman R, Cohen DJ. Israeli preschool children under SCUDs: A 30-month follow-up. Journal of American Academy of Child and Adolescent Psychiatry. 1997; 36(3):349–356.

Laor N, Wolmer L, Mayes LC, Golomb A, Silverberg DS, Weizman R, Cohen DJ. Israeli preschoolers under SCUD missile attacks: A developmental perspective on risk-modifying factors. Archives of General Psychiatry. 1996; 53:416–423. [PubMed: 8624185]

McFarlane AC. Posttraumatic phenomena in a longitudinal study of children following a natural disaster. Journal of American Academy of Child and Adolescent Psychiatry. 1987a; 26(5):764–769.

McFarlane AC. The relationship between patterns of family interaction and psychiatric disorder in children. Australian and New Zealand Journal of Psychiatry. 1987b; 21:383–390. [PubMed: 3435378]

Mirzamani M, Bolton D. PTSD symptoms of mothers following occurrence of a disaster affecting their children. Psychological Reports. 2002; 90:431–438. [PubMed: 12061580]

Moos RH, Moos BS. A typology of family social environments. Family Processes. 1976; 15:357–371.

Nakonezny PA, Reddick R, Rodgers JL. Did divorces decline after the Oklahoma City bombing? Journal of Marriage and Family. 2004; 66:90–100.

Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: Part 1. An empirical review of the empirical literature, 1981–2001. Psychiatry. 2002; 65(3):207–239. [PubMed: 12405079]

Norris FH, Uhl GA. Chronic stress as a mediator of acute stress: The case of Hurricane Hugo. Journal of Applied Social Psychology. 1993; 23(16):1263–1284.

Pfefferbaum B, Seale TW, Brandt EN Jr, Pfefferbaum RL, Doughty DE, Rainwater SM. Media exposure in children one hundred miles from a terrorist bombing. Annals of Clinical Psychiatry. 2003; 15(1):1–8. [PubMed: 12839427]

Pfefferbaum RL, Jacobs AK, Pfefferbaum B, Noffsinger MA, Sherrieb K, Norris FH. The burden of disaster: Part II. Applying interventions across the child's social ecology. International Journal of Emergency Mental Health. (in press).

Quinn SC. Hurricane Katrina: A social and public health disaster. American Journal of Public Health. 2006; 96(2):204. [PubMed: 16380553]

Riley, JR.; Masten, AS. Resilience in context. In: Peters, RD.; Leadbeater, B.; McMahon, RJ., editors. Resilience in children, families and communities: Linking context to practice and policy. New York: Kluwer Academic/Plenum; 2005. p. 13-25.

Rodgers JL, StJohn CA, Coleman R. Did fertility go up after the Oklahoma City bombing? An analysis of births in metropolitan counties in Oklahoma, 1990–1999. Demography. 2005; 42(4): 675–692. [PubMed: 16463916]

Russoniello CV, Skalko TK, O'Brien K, McGhee SA, Bingham-Alexander D, Beatley J. Childhood posttraumatic stress disorder and efforts to cope after Hurricane Floyd. Behavioral Medicine. 2002; 28:61–71.10.1080/08964280209596399 [PubMed: 12613287]

Scaramella LV, Sorh-Preston SL, Callahan KL, Mirabile SP. A test of the family stress model on toddler-aged children's adjustment among Hurricane Katrina impacted and non-impacted low-income families. Journal of Clinical Child and Adolescent Psychology. 2008; 37(3):530–541. [PubMed: 18645744]

Scheeringa MS, Zeanah CH. Reconsideration of harm's way: Onsets and comorbidity patterns of disorders in preschool children and their caregivers following Hurricane Katrina. Journal of Clinical Child and Adolescent Psychology. 2008; 37(3):508–518. [PubMed: 18645742]

Shannon M, Lonigan CJ, Finch AJ, Taylor CM. Children exposed to disaster: I. Epidemiology of post-traumatic symptoms and symptoms profiles. Journal of American Academy of Child & Adolescent Psychiatry. 1994; 33(1):80–93.10.1097/00004583-199401000-00012

Shaw JA, Applegate B, Schorr C. Twenty-one-month follow-up study of school-age children exposed to Hurricane Andrew. Journal of American Academy of Child & Adolescent Psychiatry. 1996; 35(3):359–364.10.1097/00004583-199603000-00018

Shaw JA, Applegate B, Tanner S, Perez D, Rothe E, Campo-Bowen AE, Lahey BL. Psychological effects of Hurricane Andrew on an elementary school population. Journal of American Academy of Child & Adolescent Psychiatry. 1995; 34(9):1185–1192.10.1097/00004583-199509000-00016

Shaw, JA.; Espinel, Z.; Shultz, JM. Children: Stress, trauma and disasters. Miami, FL: Center for Disaster and Extreme Preparedness; 2007. Child and family assessment; p. 104-111.Retrieved from http://deep.med.miami.edu/x466.xml

Silverman, WK.; La Greca, AM. Children experiencing disasters: Definitions, reactions, and predictors of outcomes. In: La Greca, AM.; Silverman, WK.; Vernberg, EM.; Roberts, MC., editors. Helping children cope with disasters and terrorism. Washington, DC: American Psychological Association; 2002. p. 11-33.

Stokols D, Misra S, Runnerstrom MG, Hipp JA. Psychology in an age of ecological crisis: From personal angst to collective action. American Psychologist. 2009; 64(3):181–193.10.1037/a0014717 [PubMed: 19348519]

Swenson CC, Saylor SF, Powell MP, Stokes SJ, Foster KY, Belter RW. Impact of a natural disaster on preschool children: Adjustment 14 months after a hurricane. American Journal of Orthopsychiatry. 1996; 66(1):122–130. [PubMed: 8720649]

Terranova AM, Boxer P, Morris AS. Factors influencing the course of posttraumatic stress following a natural disaster: Children's reactions to Hurricane Katrina. Journal of Applied Developmental Psychology. 2009; 30:344–355.10.1016/j.appdev.2008.12.017

Vernberg EM, La Greca AM, Silverman WK, Prinstein MJ. Prediction of posttraumatic stress symptoms in children after Hurricane Andrew. Journal of Abnormal Psychology. 1996; 105(2): 237–248.10.1037/0021-843X.105.2.237 [PubMed: 8723005]

Waller MA. Resilience in ecosystemic context: Evolution of the concept. American Journal of Orthopsychiatry. 2001; 71(3):290–297. [PubMed: 11495331]

Wasserstein SB, La Greca AM. Hurricane Andrew: Parent conflict as a moderator of children's adjustment. Hispanic Journal of Behavioral Sciences. 1998; 20(2):212–224.

Weems CR, Overstreet S. Child and adolescent mental health research in the context of Hurricane Katrina: An ecological needs-based perspective and introduction to the special section. Journal of Clinical Child and Adolescent Psychology. 2008; 37(3):487–494. [PubMed: 18645740]

Winje D, Ulvik A. Long-term outcome of trauma in children: The psychological consequences of a bus accident. Journal of Child Psychology and Psychiatry. 1998; 39(5):635–642. [PubMed: 9690927]

Wolmer L, Laor N, Gershon A, Mayes LC, Cohen DJ. The mother-child dyad facing trauma: A developmental outlook. The Journal of Nervous and Mental Disease. 2000; 188(7):409–415. [PubMed: 10919698]