

PSYCHOSOCIAL CONSIDERATIONS ABOUT CHILDREN AND RADIOLOGICAL EVENTS

Louise Lemyre*, Wayne Corneil, Colleen Johnson and Paul Boutette
University of Ottawa, 55 Laurier Ave East, Ottawa, ON K1N 6N5, Canada

*Corresponding author: louise.lemyre@uottawa.ca

Children are identified as a vulnerable population in the case of radiological events because of their increased physical sensitivity to radiation and its impact on critical development stages. Using a comprehensive integrated risk framework, psychosocial risk protective factors are discussed in a social ecology paradigm. Children have been shown to be both vulnerable and resilient; they are both easily impressionable and also quick to adapt and learn. Psychosocial interventions during, after and most efficiently before an event can improve outcome, especially if they involve parents and schools, media and work organisations. Public education through children should be encouraged to increase knowledge of radiation and strategies to minimise exposure and irradiation. Children can become vectors of prevention, preparedness and mitigation through information and behavioural rehearsal. Special consideration must therefore be given to education, school programmes, practice rehearsal and media exposure.

INTRODUCTION

Children are generally identified as a vulnerable population in the case of radiological events because of their increased physical sensitivity to radiation and its impact on critical developmental stages. But children are not just people in miniature who get a weighted dose of radiation. They behave and react differently when compared with adults. At the psychosocial level, children have been shown to be both vulnerable and also resilient. Indeed, children are both easily impressionable and also quick to adapt and learn. Using a systems approach, this paper will discuss the ripple effects of radiological events on children, their families, schools and upon first responders, from pre-event through impact and reconstruction phases. It will document needs, impact and lessons referring to cases relevant because they either involved radioactive agents or were focused on children, such as evidence from the Goiania, Oklahoma, Beslan, 9/11 and Chernobyl instances.

Psychosocial considerations include emotion, cognition and behaviour: how one feels, thinks and behaves. These play not only at the individual level but also dynamically in a social ecology, involving parents, schools and services⁽¹⁾. Psychosocial considerations also span across the time frame from threats to recovery. Although most attention is usually focused on rescue efforts, psychosocial considerations should be especially examined pre-event for preparedness and prevention. This paper will use the opportunity to re-frame the notion of vulnerability and to favour a comprehensive integrated risk analysis approach that links risk characterisation to

consequence management at both the physical and psychosocial levels⁽²⁾. The descriptive 'vulnerable population' insinuates a generic intrinsic fatalistic fragility in people. It offers a bleak outcome, suggests a passive process, and it dis-empowers individuals. It fails to distinguish between the critical pathways of risk: either (1) susceptibility to exposure, (2) sensitivity to effect, (3) differential access to mitigation or (4) variable efficacy of countermeasures⁽³⁾. Each of these can point to different interventions. The label 'vulnerable' also masks the potential assets and protective factors embedded in specific contexts. It therefore seems more productive to talk of higher-risk, or at-risk, populations and identify the risk factors, as well as show the resilience potential, identify protective factors and emphasise assets in situations. Finally, the discussion will suggest systemic interventions that are relevant for the rescue and recovery phases, while insisting on the preparedness and prevention.

CHILDREN AS A HIGHER-RISK POPULATION

At the physical level

Children are at higher risk in radiological events because they are physically more exposed due to their relative proximity to the ground, inhalation rate and tendency to touch things and put them to their mouth. They are naturally curious, therefore more likely to play with a source, like it happened in the Goiania clinic incident, plus they have a tendency to gather in large groups, such as day-care centres or schools, and share objects. Duration of

exposure to harmful agents may be increased in children because they are sometimes unable to escape or unable to rescue themselves. They are at higher risk because they are less likely to know how to flee from sources of radiation, to self-decontaminate, disrobe and wash it off. Moreover, they are at higher risk because they are more sensitive to radiation in relation to their developmental stages, especially for bones, organs and cells⁽⁴⁾. Finally, treatments are less available, less efficient and less documented for children⁽⁵⁾.

At the psychological level

Exposure to trauma

At the psychosocial level, children are at higher risk of distress if they are directly exposed to trauma, indirectly exposed (through intense television viewing, for example), or if close ones like parents are victims or involved in the event; and it will have also ripple effects upon the rest of the family^(6–8). Children are emotionally sensitive and they readily express their reactions. They are also inclined to somatisation and their fear or anxiety, legitimate or irrational, will easily manifest into nausea, diarrhoea and skin eruption, all which can be confounded with effects of actual radioactivity exposure.

Socio-demographic variations

Emotional response to radiological and other traumatic events, varies by age group, developmental stage and gender⁽⁶⁾. It also varies by economic and social status due to a higher exposure rate to adversity, poorer access to mitigation and other compounding factors. Additionally, children who belong to ethnic minority groups may be at greater risk to negative psychological outcomes⁽⁹⁾, either because expression of emotion may differ in their culture or because they have been pre-sensitised to trauma, insecurity or loss linked to their biographical history.

Influence of parents

Children have a tendency to mirror the stress reactions of their parents or caregivers, which puts some children at a higher risk for developing post-traumatic stress disorder (PTSD)^(4, 7, 10). Following the World Trade Center attacks on September 11th, a study of pre-school children and their mothers revealed that children are more likely to experience clinically significant behavioural problems if their mothers experience depression or PTSD⁽⁶⁾, as it is true of any child of parents with mental health problems. The risk of behavioural problems increased among those children, and especially among pre-school aged boys, whose mothers experienced both

PTSD and depression. Studies of older children following the September 11th attacks reveal that girls experience a significantly higher rate of PTSD than do boys⁽¹¹⁾. Boys are more prone to outward hostility, whereas girls are more likely to become withdrawn, anxious or depressed following direct or indirect exposure to significant trauma^(10, 11). Females show more expressive affective disturbance, whereas males might present more asocial symptoms, acting out and disruptive behaviours.

Deferred symptoms

Children's psychological responses may be delayed or may increase over time. Thus, there is a need to monitor children over time. Common psychological reactions include: regressive behaviours, sleep disturbances, fatigue, unusual expressions of anger, apathetic behaviour, changes in appetite, mood swings, increased activity level, lack of ability to experience pleasure and substance abuse^(12, 13). Babies may become more irritable following exposure to a traumatic event or they may have increased difficulty with sleeping⁽¹³⁾.

Somatisation

Much like adults, children are vulnerable to somatic symptoms. For example, reports of somatisation among children occurred in a school following rumours and fears of natural gas exposure⁽¹⁴⁾. This mass sociogenic illness occurred by proxy in that parents spread their concern to their children, which elicited the psychogenic response in the children. Similarly, following the accidental exposure of Caesium 137 in Goiania, Brazil, ~112 000 people, including parents, arrived at a local stadium to be screened for exposure to the radioactive material⁽¹⁵⁾. Somatisation of anxiety, with nausea, diarrhoea and skin eruption may easily be confounded with possible symptoms of radiation exposure.

Pre-existing conditions

Pre-existing mental health conditions also result in increased risk for development of psychopathology among children⁽⁷⁾. Proximal or prolonged exposure to an environment of threat, alert or expectation that a major event is imminent will result in distress, maladjustment and the potential for psychopathology development among anxiety-prone children⁽¹¹⁾.

Secondary stressors

Secondary stressors may at times be more harmful than the impact itself of the core event and may exacerbate stress among children exposed to extreme events^(7, 16). These secondary stressors include the

death of a family member, injuries, separation from family, difficulties with finding access to food and water, disruption of routines, loss of cherished possessions as well as relocation. Evacuation contributes to secondary stress among children⁽¹²⁾. A study of children who evacuated to Kiev following the Chernobyl accident, found that those children who had evacuated had poorer well-being than their classmates who had stayed⁽¹⁷⁾. Separation from family is the single most significant risk factor for both children and parent distress.

Media

Exposure to media has also been shown to be significantly related to distress in children, especially when continuous re-enactment may be confounded by children with repeated occurrences. Following September 11th, over 99 % of Americans polled in a 2004 study described watching the attacks through ‘round the clock’ coverage⁽¹⁸⁾. A relationship was found with regard to unrestricted viewing of this coverage between the number of hours of television viewed and the stress reactions of children^(19, 20). Empirical evidence has shown that children located within 100 miles of a disaster resulting in a loss of human life are significantly negatively affected by media coverage of events^(11, 19). PTSD and other anxiety-related symptoms may result from excessive exposure to such media coverage. Pfefferbaum *et al.*'s⁽¹⁹⁾ 2003 study of children following the Oklahoma bombing found that print media exposure was also strongly associated with post-traumatic symptoms, perhaps due to the active nature of reading content compared with the passive nature of viewing television. In an era of continuous and bidirectional news sources, further study is needed with respect to media impact, including secondary exposure through social media. Exposure through Internet and chat lines merits special consideration and further studies, especially for the youth.

Children as targets

Children can also be at higher risk of exposure to radiological events because they are attractive potential targets. ‘As outrageous as it may seem to most of us, terrorists have been more than willing to attack targets where injury and death of children are very likely to occur⁽⁴⁾. This is evidenced by the 2004 terrorist attack on a grade school in Beslan, Russia by Chechen militants in which more than half of the 350 fatalities were children. However, history shows no cases of terrorist radiological events to date⁽²¹⁾. This being said, any major event that involves children will generate more attention, public outrage, scrutiny about response efficiency and will impact the responders more severely. A whole chain of

ripples including parents, media and workers will magnify the event.

CHILDREN AS A RESILIENT POPULATION

While children are an at-risk population in the context of a radiological event, they are also psychologically highly resilient. Children have been shown to recover spontaneously to functional levels of performance within 6 months of traumatic events and to return to playful and social activities. In fact, the majority of children are not likely to develop a mental health disorder following exposure to a traumatic event^(11, 22). Some children may even experience positive changes following a disaster, such as an increased sense of self-mastery, otherwise known as post-traumatic growth.

Family unit

Reunification with parents has been identified as an important step in reducing distress as well as secondary harm and accidents such as falls, choking, poisoning or child abuse. Preservation of the family unit is of the utmost importance following an extreme event and does much to mitigate negative psychosocial effects⁽²³⁾. Pre-event planning for large numbers of displaced children is an important prevention measure. Developing systems for reunification with families became a challenge following Hurricane Katrina, when more than 2000 children were reported missing from their families during the hurricane's aftermath and ‘Operation Child-ID’ was used to help identify lost children and reunite them with their parents⁽²³⁾.

Expression of emotions

Good clinical interventions have been established that vary by age group and include (1) reuniting children with parents; (2) encouraging expression through play and discussion with parents, or alternatively, with peers; (3) giving credible reassurance; (4) clarifying misconceptions; and (5) encouraging social activities⁽¹⁶⁾. Support for open discussion has facilitated coping both in children and adults surrounding them. Expression may occur in natural and community settings. Studies of children who received treatment following September 11th demonstrate that boys were more likely than girls to receive counselling and older children aged 6–17 were more likely to receive services than younger children⁽¹¹⁾.

Control, self-efficacy and empowerment

Resilience has been largely documented in children who have experienced extremely adverse life events⁽²⁴⁾. Known protective factors that enhance

adaptation and facilitate a return to functional state include (1) a secure relationship with a significant adult, (2) a sense of personal control through action, (3) sense making and (4) prior experience of self-efficacy and self-esteem^(25–27).

A number of successful interventions can occur in natural contexts. Following the Oklahoma bombing, parents were advised that children needed more encouragement and praise for small successes, a reassuring touch (such as pats on the back), increased help with activities that children would normally be able to complete on their own and a mode for expressing their feelings through play or art⁽¹²⁾.

Assets

Children may also be seen as assets in an extreme event, as the natural tendency for people wanting to help and connect can be seen even in young children. They can easily be vectors of health and safety programmes. Children are quick to adapt and learn, allowing them to absorb disaster training instructions. Preparedness information may be carried from children to the parents or caregivers, particularly in the case of preventative school programming.

School programmes are often the vector for counselling of children following traumatic events. School-based psychosocial intervention programmes may be used to screen large numbers of children following an extreme event, so that children that require help are identified and referred to the appropriate level of care⁽²⁸⁾. For example, Project Heartland was used to provide over 50 000 contact hours to over 5000 individuals⁽²⁹⁾ including children, parents and school staff. 'Teachers and staff were trained in topics such as the emotional impact of disasters, the effects of trauma and grief on classroom behaviour, holiday and anniversary reactions, stress management, expression through art, the impact of the trial, and conflict mediation⁽²⁹⁾.' While such post-disaster interventions are essential, prevent disaster preparedness can have an empowering effect on children and adults alike, as behavioural rehearsal can be used to help children learn how to respond.

CONSIDERATIONS FOR INTERVENTIONS

Considerations at time of event

At rescue, children are obviously an important group to care for following a disaster. First responders may have a difficult time dealing with paediatric injuries or casualties⁽⁴⁾. Also, responders may become preoccupied with their own families as a result of powerful emotions that are triggered by interactions with children. Emergency medical personnel must also be prepared to deal with a relative

lack of local paediatric speciality resources⁽⁵⁾. Paediatric wards and children's hospitals must be prepared for increased patient loads, injured casualties, exposed victims, somatising bystanders and anxious parents⁽⁴⁾. Of course, infants, toddlers, children and adolescents are differentially affected and thus require different interventions and considerations.

Treatments often need to be modified to account for children's decreased body mass and differing physiology^(4, 5). First responders often have less experience with these modified treatments and must be prepared to deal with a lack of familiarity with paediatric antidotes and treatments and a lack of paediatric drug formulations⁽³⁰⁾.

Children also have unique needs during decontamination. Children cannot easily be decontaminated in adult decontamination units⁽⁵⁾. They may be unable to self-decontaminate, have difficulty following instructions, or they may be afraid of the way that emergency responders appear in their protective equipment. Some children may have special needs or may be non-ambulatory; plus infants and toddlers require differing procedures. Concerns about water pressure and water temperature must be addressed. Children are at greater risk of hypothermia following decontamination due to their increased surface area to volume ratio, lesser subcutaneous fat stores and thinner epidermises^(4, 31). Post-decontamination clothing for children and infants is therefore an important prevention strategy with respect to risk of hypothermic reactions. There are also issues of consent regarding mass decontamination in schools. Mental health concerns must also be examined in order to avoid secondary trauma from decontamination.

Evacuation of afflicted zones may constitute an additional difficulty as it may instil fear of disconnect with parents, schoolmates and familiar surroundings. Means of communication and familiar cues should be restored as soon as possible.

Basic needs for a sense of security are a priority, followed by physical needs of thirst, hunger and cold, which will all be exacerbated in children. Comfort and reassurance, especially from a familiar and trusted source, is critical.

Considerations over time

Longer-term recovery is a concern. Many of the syndromes may take time to crystallise. Often, PTSD requires months to be diagnosed, and what can be seen as a proportional reaction shortly after a major event becomes a source of concern if it lasts over 6 months, or more than a year. Hence, follow-up with mental health services is essential to long-term recovery⁽⁷⁾. Additionally, it is essential for caregivers to have access and seek professional psychosocial

assistance if new behaviours interfere with activities of daily life, if substance abuse occurs, or if the child or young adult experiences persistent suicidal thoughts, flashbacks, flash forwards, chronic unexplained physical symptoms, recurrent insomnia, depression or aggressive behaviour.

Considerations for families

Family situations are variable, both by composition and by socio-economic status. Families are the basic functional unit of analysis to be considered for managing children's risk. Reunification of lost children with caregivers, whether the caregivers are parents, grandparents, single parents or foster parents is a primary concern following a disaster. Efforts must be made to keep families together and to reunite children with their parents or other caregivers when they are separated⁽³²⁾, especially during decontamination procedures⁽³¹⁾. Depression and anxiety in parents are well-documented risk factors for children's mental health and accident proneness. Hence, there is a need to address the whole family as the unit of intervention after a major event.

It is also important to recognise that individuals play multiple roles within a population. Workers are also parents. Response plans must therefore account for the parental role of workers. For example, while response plans may tell workers to shelter in place, it is more likely that as parents they will leave their place of work or their home to pick up children from school. People behave in purposeful and adaptive ways based on their perceptions, motivations and understanding of events. Accurate information and appropriate explanations about events should be readily available and widely disseminated so that people can understand which course of actions is sounder.

Pregnant mothers also require special consideration following a radiological event, not only because of the biological impact upon the unborn, but also because abortion rates may rise, as was documented in Chernobyl. Fecundity rates (for both males and females) were significantly lowered over many years, linked to self-imposed measures of prevention. Fear of the effects of exposure to radiation is a common psychological outcome following a radiological disaster, especially in pregnant women and in children, with fears of deformity, cancer and premature death⁽³³⁾. Adequate information is needed to explicitly address these concerns.

Considerations for schools

Parents, teachers and counsellors should learn to identify and differentiate stress reactions, distress and post-traumatic stress symptoms in children. They should also know how to convey credible reassurances and foster a sense of security, while guiding

children through appropriate self-protection responses. Schools are an ideal milieu to foster education about radiation, encourage exercises and drills (such as decontamination) with behavioural rehearsal and cognitive planning. They offer a safe environment to learn basics and discuss concerns.

Considerations for the media

Given the major emotional impact of the media on children, monitoring news content and limiting the amount of time children are exposed to traumatic imagery are important interventions in mitigating the effects of media exposure⁽¹⁹⁾. Open discussion of imagery and news coverage between parents and children is recommended to improve media literacy^(11, 34). Small children may need to be reassured that they did not cause an event to happen and viewers need to be reminded that repetition of footage does not constitute reoccurrence of the event.

The media also has a social responsibility. It should monitor content shown, choice of imagery and warn audiences to remove young children before showing particularly graphic imagery or otherwise disturbing content. Limited time exposure to media plus qualifying explanations and guidance by parents or adults has been shown to facilitate understanding and adaptation in children. Media may also play an important role in the preparedness of citizens by fostering public education on radioactivity, showing scenarios of accidents and modelling the appropriate responses.

Considerations for organisations

Workers are parents and organisations should prioritise securing the families of their workers, informing them of the status of loved ones and nature of the risks, especially in organisations involving responders and health workers who are more likely to be exposed and contaminated. Organisations dealing with emergency response are also responsible for supplies; they need to ensure they have adequate resources to address the needs of children.

Paediatricians, social workers and psychologists may be of great support for prevention as they can advocate for children and review disaster plans with families, schools, communities and policy makers⁽³⁵⁾. They can provide guidance to parents about disaster preparedness, which has the potential to have an empowering effect⁽³⁰⁾.

Children as vector of preparedness

Because they are resilient, quick to learn and encouraged through projects that enabled them to take action, school children can be considered—and

should be used—as vector of preparedness for radiological events. Intermediary and high school children can learn basic knowledge about radiation, the difference between being irradiated and being radioactive, the parallel with preventing contagion, scale of doses in daily life comparing sources such as the sun, cell phones, cell towers, X rays, radiological work, and external and internal contamination. Older children can also learn the appropriate behavioural response to avoid and mitigate contamination: disrobing, washing and preventing inhalation or ingestion. Bringing these notions home and preparing family exercises would contribute to the transfer of knowledge to parents.

Radiological events are rare and usually require immediate remediation; therefore, involving children, students and parents in self-protection will likely be a winning strategy.

CONCLUSION

Children require special consideration in disaster planning, including for radiological incidents. Children are both a resilient population, capable of learning quickly and a population at risk—both physically and emotionally. Traditional and non-traditional responders must have knowledge of at-risk groups and accrued risk factors, as well as of efficacious protective factors that can facilitate their work and improve outcome.

During response, flexibility is important in responding to mass emergency situations involving children and principles should be followed rather than overly strict protocols that may not have provisions for children⁽²³⁾.

Post-incident, parents and schools are key actors to explain events and help children find a form of control, coherence and predictability in order to achieve a sense of security. Early reunification with family is a critical ingredient both for children and parents alike. Return to routine, such as schooling, even in a modified environment such as a shelter, is a facilitator of resilience.

Pre-incident, the most effective interventions are to plan, prepare and prevent. It involves generic public education about radiation. Differentiating the risks of being irradiated with those of being radioactive is critical in appraising the appropriate course of action. Basic knowledge to protect oneself and dear ones from exposure, especially inhalation and ingestion is needed widely. Community preparation and response can be bolstered by school programmes that promote education and behavioural rehearsal. Pre-event programmes can be used to transfer knowledge from children to caregivers, family and the community at large.

FUNDING

This work was supported by Defence Research and Development Canada CRTI program, the Social Sciences and Humanities Research Council of Canada and the R.S. McLaughlin Foundation.

REFERENCES

1. Lemyre, L. and Orpana, H. *Integrating population health into social ecology: Role of family medicine researchers*. *Can. Fam. Physician* **48**, 1349–1350 (2002).
2. Lemyre, L., Clément, M., Corneil, W., Craig, L., Boutette, P., Tyshenko, M. G., Karyakina, N., Clarke, R. and Krewski, D. *A psychosocial risk assessment and management framework to enhance response to CBRN terrorism threats and attacks*. *Biosecur. Bioterror.* **3**, 316–330 (2005).
3. Lemyre, L., Gibson, S., Zlepnic, J., Meyer-Macleod, R. and Boutette, P. *Emergency preparedness for higher risk populations: psychosocial considerations*. *Radiat. Prot. Dosim.* **134**, 207–214 (2009).
4. Grey, M. R. and Spaeth, K. R. (eds) *Vulnerable groups: A summary of relevant concerns*. The Bioterrorism Sourcebook. **Vol. 6** (New York: McGraw-Hill) pp. 93–99 (2006). ISBN 0071440860.
5. Markenson, D. and Redlener, I. *Pediatric terrorism preparedness national guidelines and recommendations: findings of an evidenced-based consensus process*. *Biosecur. Bioterror.* **2**, 301–319 (2004).
6. Nomura, Y. and Chemtob, C. M. *Effect of maternal psychopathology on behavioral problems in preschool children exposed to terrorism: use of generalized estimating equations to integrate multiple informant reports*. *Arch. Pediatr. Adolesc. Med.* **163**, 531–539 (2009).
7. Pfefferbaum, B., Houston, J. B., North, C. S. and Regens, J. L. *Youth's reactions to disasters and the factors that influence their response*. *Prev. Res.* **15**, 3–6 (2008).
8. Pfefferbaum, B., Doughty, D. E., Reddy, C., Patel, N., Gurwitch, R. H., Nixon, S. J. and Tivis, R. D. *Exposure and peritraumatic response as predictors of posttraumatic stress in children following the 1995 Oklahoma City bombing*. *J. Urban Health* **79**, 354–363 (2002).
9. Silverman, W. K. and La Greca, A. *Children experiencing disasters: definitions, reactions, and predictors of outcomes*. In: *Helping Children Cope with Disasters and Terrorism*. La Greca, A. M., Silverman, W. K., Vernberg, E. M. and Roberts, M. C., Eds. (Washington, DC: American Psychological Association) pp. 11–33 (2002). ISSN 1546–2250.
10. Stuber, J., Fairbrother, G., Galea, S., Pfefferbaum, B., Wilson-Genderson, M. and Vlahov, D. *Determinants of counseling for children in Manhattan after the September 11 attacks*. *Psychiatr. Serv.* **53**, 815–822 (2002).
11. Comer, J. S. and Kendall, P. C. *Terrorism: the psychological impact on youth*. *Clin. Psychol.* (New York) **14**, 179–212 (2007).
12. Sanders, J. M. and Flynn, B. W. *Psychosocial Issues for Children and Families in Disasters: A Guide for*

- the Primary Care Physician (Elk Grove Village, IL: United States Department of Health and Human Services) 6-2-0010 (1995).
13. Gurwitsch, R. H., Pfefferbaum, B. and Leftwich, M. J. T. *The impact of terrorism on children*. *J. Trauma Pract.* **1**, 101–124 (2002).
 14. Philen, R. M., Mckinley, T. W., Kilbourne, E. M. and Parrish, R. G. *Mass sociogenic illness by proxy—parentally reported epidemic in an elementary-school*. *Lancet* **2**, 1372–1376 (1989).
 15. Curado, M. P. *The communication of radiological risk to populations exposed to a radiological accident: considerations concerning the accident in Goiânia*. *Radiat. Prot. Dosim.* **68**, 283–286 (1996).
 16. Shultz, J. M., Espinel, Z., Flynn, B. W., Hoffman, Y. and Cohen, R. E. *DEEP PREP: All-hazards Disaster Behavioral Health Training* (Miami: DEEP Center, University of Miami) (2008).
 17. Bromet, E. J., Goldgaber, D., Carlson, G., Panina, N., Golovakha, E., Gluzman, S. F., Gilbert, T., Gluzman, D., Lyubsky, S. and Schwartz, J. E. *Children's well-being 11 years after the Chernobyl catastrophe*. *Arch. Gen. Psychiatry* **57**, 563–571 (2000).
 18. Nacos, B. L. *The terrorist calculus behind 9–11: a model for future terrorism?* *Stud. Confl. Terror* **26**, 1–16 (2003).
 19. Pfefferbaum, B., Seale, T. W., Brandt, E. N. J., Pfefferbaum, R. L., Doughty, D. E. and Rainwater, S. M. *Media exposure in children one hundred miles from a terrorist bombing*. *Ann. Clin. Psychiatry* **15**, 1–8 (2003).
 20. Schuster, M. A., Stein, B. D., Jaycox, L. H., Collins, R. L., Marshall, G. N., Elliott, M. N., Zhou, A. J., Kanouse, D. E., Morrison, J. L. and Berry, S. H. *A national survey of stress reactions after the September 11, 2001, terrorist attacks*. *N. Engl. J. Med.* **345**, 1507–1512 (2001).
 21. Lemyre, L. and ASSRBCVUL Group. *Assessment of the vulnerabilities of modern societies to terrorist acts employing radiological, biological or chemical agents*. European Union Research Commission 6th Framework Report Project 502 476 (Chemical, Biological, Radiological & Nuclear (CBRN) Research and Technology Initiative (CRTI)) Project #CRTI02-0080RD (2007).
 22. Markon, M. P. L. and Lemyre, L. *Représentations et imageries d'enfants à propos de la Tempête de Verglas de 1998 en Montérégie*. *Rev. Québécoise Psychol.* **30**, 197–217 (2010).
 23. Brandenburg, M. A., Watkins, S. M., Brandenburg, K. L. and Schieche, C. *Operation child-ID: reunifying children with their legal guardians after Hurricane Katrina*. *Disasters* **31**, 277–287 (2007).
 24. Masten, A. S. *Promoting resilience in development: a general framework for systems of care*. In: *Promoting Resilience in Child Welfare*. Flynn, R., Duddling, P. M. and Barber, J. G., Eds. (Ottawa: University of Ottawa Press) (2006). ISBN 978-0776635538.
 25. Bandura, A. *Self-efficacy mechanism in human agency*. *Am. Psychol.* **37**, 122–147 (1982).
 26. Bonnano, G. A., Galea, S., Bucchiarelli, A. and Vlahov, D. *What predicts psychological resilience after disaster? The role of demographics, resources and life stress*. *J. Consult. Clin. Psychol.* **75**, 671–682 (2007).
 27. Rutter, M. *Resilience reconsidered: conceptual considerations, empirical findings, and policy implications*. In: *Handbook of Early Childhood Intervention*, second edn. Shonkoff, J. P. and Meisels, S. J., Eds. (New York: Cambridge University Press) pp. 651–681 (2000). ISBN 978-0521585736.
 28. La Greca, A. M. and Silverman, W. K. *Treatment and prevention of posttraumatic stress reactions in children and adolescents exposed to disasters and terrorism: what is the evidence?* *Child Dev. Perspect.* **3**, 4–10 (2009).
 29. Pfefferbaum, B., Call, J. A. and Sconzo, G. M. *Mental health services for children in the first two years after the 1995 Oklahoma city terrorist bombing*. *Psychiatr. Serv.* **50**, 956–958 (1999).
 30. Cicero, M. X. and Baum, C. R. *Pediatric disaster preparedness—best planning for the worst-case scenario*. *Pediatr. Emerg. Care* **24**, 478–481 (2008).
 31. Waisman, Y., Aharonson-Daniel, L., Meirav, M., Amir, L. and Peleg, K. *The impact of terrorism on children: a two-year experience*. *Prehosp. Disaster Med.* **18**, 242–248 (2003).
 32. Gausche-Hill, M. *Integrating children into our emergency care system: achieving the vision*. *Ann. Emerg. Med.* **48**, 131–134 (2006).
 33. Speckhard, A. *Prevention strategies and promoting psychological resilience to bioterrorism through communication*. In: *Risk Assessment and Risk Communication Strategies in Bioterrorism Preparedness*. Green, M. S., Zenilman, J., Cohen, D., Wiser, I. and Balicer, R. D., Eds. (Dordrecht: Springer) pp. 135–162 (2007). ISBN 978-1402058073.
 34. Pfefferbaum, B., Gurwitsch, R. H., McDonald, N. B., Leftwich, M. J. T., Sconzo, G. M., Messenbaugh, A. K. and Schultz, R. A. *Posttraumatic stress among young children after the death of a friend or acquaintance in a terrorist bombing*. *Psychiatr. Serv.* **51**, 386–388 (2000).
 35. Ablah, E., Tinius, A. M. and Konda, K. *Pediatric emergency preparedness training: are we on a path toward national dissemination?* *J. Trauma* **67**, 152–158 (2009).