

# First Responders after Disasters: A Review of Stress Reactions, At-Risk, Vulnerability, and Resilience Factors

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## Abbreviations:

CISD = Critical Incident Stress Debriefing  
NGO = non-governmental organization  
NICE = National Institute for Clinical Excellence  
PFA = Psychological First Aid  
PTSD = post-traumatic stress disorder  
TRiM = Trauma Risk Management

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## Abstract

Disasters are widely reported, commonplace events that characteristically leave an enormous legacy of human suffering through death, injury, extensive infrastructural damage, and disorganization to systems and communities. The economic costs may be almost incalculable. Professional and civilian first responders play a vital role in mitigating these effects. However, to maximize their potential with the minimum health and welfare costs to first responders, it is important to have a good understanding of the demands of such work on them, how they cope, and what enables them to fulfill their roles. This review will explore these themes by highlighting important findings and areas of uncertainty

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## Introduction

Disasters triggered by natural and human-caused events, including terrorist incidents, are becoming more common, and the details of their effects are disseminated widely throughout the international media and professional literature. Sundnes and Birnbaum report that between 1951 and 2000, there had been 7,312 disasters, resulting in more than nine million deaths, and costing [US]\$961,895,000.<sup>1</sup>

A wide range of professional and lay groups and organizations play an increasingly important role in the aftermath of such events. Therefore, it is difficult to find a sufficiently encompassing collective noun to include the work of, for example, the emergency services, helicopter pilots, divers, mountain rescuers, coast guards, hospital trauma care personnel, Search-and-Rescue teams, dog handlers, and the representatives of non-governmental organizations (NGOs), such as the Red Cross and Red Crescent Societies. In addition, particularly in resource-poor countries, there are persons who respond to disasters who are merely well-intended laypersons, often with little or no relevant training. To limit the scale of this review, the term *first responder* will be used to include all staff of statutory bodies who may be required to assist in the acute phase of a major incident by providing various types of rescue, emergency, and healthcare services, as well as those volunteers from major charitable and other NGOs who offer their services to the same end. It is recognized that some groups (e.g., Search-and-Rescue personnel of the British Civil Defence) may be trained specifically for disaster work, whereas other persons may be drawn from their own organizations without any specific disaster training. However, these personnel may be well trained in their own disciplines. This review will not address issues relating to survivors of, or bystanders to, disasters, who might be unexpectedly cast in the role of first responders.

In the early 1980s, Raphael emphasized the potential of working in the disaster field to cause psychological damage to first responders.<sup>2</sup> Since then, although the relevant literature has grown, much of the research has been of relatively poor quality and lacks a theoretical and conceptual basis. In addition, there remains a resistance within certain organizations (particularly those in which a “macho” culture prevails), to address this issue, thereby seri-

ously increasing the risk of first responders becoming “hidden victims”.<sup>3</sup> However, McFarlane and Bryant underscore the need for employers to remember their liability for the welfare of first responders.<sup>4</sup>

The aim of this review is to highlight the current state of knowledge in regard to: (1) the impact of disaster work on the psychological and physical welfare and functioning of first responders; (2) the factors that exacerbate or mitigate the adverse effects of disaster; and (3) areas of research that require further and more rigorous empirical inquiry.

### Impact of Disaster Work on the Psychological and Physical Welfare and Functioning of First Responders

#### Key Concepts

Most research has focused on the staff of major statutory bodies, e.g., fire, police, and ambulance services. Emerging from such research, and more recently imported into research involving other agencies, are a number of key concepts. Reviews by Palm and colleagues<sup>5</sup> have identified such concepts as “vicarious traumatization”,<sup>6</sup> “compassion fatigue”,<sup>7</sup> and “burnout”.<sup>8</sup> These terms reflect the principle that providing help for victims of major trauma has the potential to be “psychotoxic” to those who provide it. However, as these reviewers note, these terms have not been well delineated. Moreover, the instruments designed to measure these effects require further psychometric development. For clarity in this review, the above concepts will be used in accordance with the definitions provided by their original proponents.

#### Disaster Stressors

To conduct their duties successfully, first responders may be exposed to a miscellany of potentially disturbing sensory stimuli, as well as emotional and cognitive experiences.<sup>9</sup> These experiences include viewing and handling bodies and mutilated remains, coping with dying victims, and exposure to individuals with grotesque and serious injuries, as well as to deeply distressed individuals, families, and even communities. In addition, perhaps most disturbing of all, they must cope with the deaths and serious injuries of children. These personnel also may have to face risks (genuine and/or perceived) to their own safety, including the exposure to toxic materials and diseases.<sup>10,11</sup> Their health and welfare may be compromised further through lack of sleep, unsuitable clothing, inadequate equipment, impoverished diet, fatigue, excessive noise, and work overload. Mission failure and excessive bureaucracy also may be encountered. First responders also may need to make major decisions, commonly under the pressure of time and with imperfect information,<sup>12</sup> and there may be personal conflicts of interest, as was described by a junior doctor after the Pakistan/Kashmir earthquake of 2005.<sup>13</sup> While this physician was evacuating seriously injured survivors, a senior colleague instructed him to give higher priority to the lesser injured members of his own family. Disasters of a particularly extensive scope and scale generate difficulty for first responders, as occurred after the Pakistan/Kashmir earthquake. Thus, they may not only become “secondary victims” (due to the distasteful nature of their duties), but as Klein and Alexander reported, they also may be “primary victims” due to the personal loss of loved ones, friends, property, and

possessions.<sup>14</sup> In other words, first responders run the risk of a dual jeopardy, particularly in the wake of extensive disasters, such as tsunamis and earthquakes.

#### Psychological Effects

While neither the pattern nor the severity of their psychological reactions may justify a formal psychiatric diagnosis, there are certain reactions that have been observed consistently in first responders. These include anxiety, hyperarousal, hypervigilance, painful recollections, and grief.<sup>5</sup> Other investigators have reported high levels of alcohol consumption among trained and volunteer personnel.<sup>15</sup> However, two points should be considered. First, high levels of alcohol consumption may not directly reflect the impact of disaster work, as it is well known that among emergency personnel, high levels of alcohol use are part of their “professional culture”.<sup>16,17</sup> Second, even when there is an increased alcohol intake following trauma work, it is most likely to be among those who are “regular drinkers”, rather than among those with no history of alcohol use.<sup>18</sup> Palm *et al* also discuss how disaster work may alter first responders’ assumptive world with regard to their own vulnerability and the natural justice in world, and how they may experience shame, anger, and sadness.<sup>5</sup> On the other hand, it may be that these emotional reactions are not the problem; the key issue may be how the first responders cope with these issues. Certain self-help measures, e.g., alcohol use, the “bottling up” of feelings, and other avoidant strategies may merely exacerbate the individual’s difficulties in adjusting.

According to the two primary nosological systems, the *Diagnostic and Statistical Manual—Fourth Edition*,<sup>19</sup> and the *ICD-10 Classification of Mental and Behavioural Disorders*,<sup>20</sup> trauma-related diagnoses are based on continua and not on categories. This poses some conceptual and measurement difficulties (although these are not exclusive to trauma-related conditions) in terms of distinguishing between normal and pathological reactions, particularly since there has been a great reliance on self-report measures in the research field, without corroboration from other sources of information. These measures tend to generate higher prevalence rates of post-traumatic conditions than do clinical interviews.<sup>21</sup> Fortunately, some investigators have used medical records<sup>22</sup> and structured clinical interviews to determine the incidence of trauma-related conditions.<sup>12</sup> These methodological points should be borne in mind when considering the following prevalence figures for psychopathology among first responders, as they may, in part, account for the marked variability among them.

#### Post-Traumatic Stress Disorder among First Responders—

Following disasters, the most frequently studied condition has been post-traumatic stress disorder (PTSD),<sup>23</sup> although some investigators<sup>24</sup> have long cautioned against perpetuating this diagnosis in its center stage role. As Klein and Alexander report, PTSD is not the most common single diagnosis after trauma, and it occurs most often in the context of co-morbidity (with depression, anxiety, and substance misuse in particular).<sup>25</sup>

Of those police officers on-duty at the Hillsborough football stadium disaster in 1989, Sims and Sims identified

44% as suffering from PTSD up to two years after the event.<sup>26</sup> After the attacks on the World Trade Center in September 2001, Galea *et al* reported that between 10% and 20% of first responders displayed features of PTSD.<sup>27</sup> Armagan and colleagues reported that one month after the tsunami in south east Asia, PTSD was noted in about one-quarter of Turkish Red Crescent Relief workers.<sup>12</sup>

*Other Post-Traumatic Conditions*—Different prevalence rates have been reported for other trauma-related disorders. Depression was reported among 15% of the rescue workers after a Taiwan earthquake.<sup>28</sup> In a follow-up of rescue workers after an air crash in the United States, Fullerton and colleagues found that approximately 22% of the workers were suffering from depression.<sup>29</sup> More than eight years after the Bijlmeer air crash in the Netherlands, Huizink and colleagues reported that 22% of police officers and 20% of firefighters experienced depression,<sup>30</sup> but North *et al* noted that only 8% of firefighters displayed depressive symptoms after the Oklahoma City bombing, and only 10% displayed features of a panic disorder.<sup>18</sup>

Following the terrorist attacks in New York in 2001, 12% of the 28,000 police officers involved in these incidents reported symptoms of an anxiety disorder.<sup>31</sup> Acute stress disorder initially was noted in 9% of young, healthy military personnel two weeks after an earthquake; however, within another two weeks, this figure had dropped to about 3%.<sup>32</sup> Fullerton and colleagues found acute stress disorder among 26% of rescue workers after an air crash.<sup>29</sup> Comparing reported prevalence figures across disasters among groups of first responders must be done cautiously because of different time frames, measures of psychopathology, and levels of exposure to the different types of trauma. Also, comparing military with civilian personnel brings into play other factors such as selection, training and experience.

#### *Physical Effects*

There has been a distinct research bias toward psychological reactions, but research has demonstrated that first responders also may experience trauma-related physical complaints. After the Enschede fireworks depot explosion, Morren *et al* reported that post-disaster musculoskeletal and respiratory conditions (probably relating to the explosion rather than to psychological factors) endured in some rescue workers for up to four years after the event.<sup>33</sup> (It should be noted that this study used controls, pre-disaster medical records, and sick leave data to determine the effects.) Another interesting observation from that project was that neurological symptoms showed a delayed onset. It has been reported widely that headaches, fatigue, abdominal and skin complaints, muscular pains, and cardiovascular symptoms trouble survivors after major incidents.<sup>31,34</sup>

Such findings articulate the need for sensitive awareness and longer-term monitoring by occupational health physicians and others responsible for the physical health and welfare of first responders: psychological reactions, as important as they are, must not become the sole focus of medical attention.

#### *Intergroup Differences*

It is unclear whether there are significant differences among the various groups of first responders involved in the

same incident; few studies have explored this issue. However, in one study, it was suggested that ambulance personnel may suffer more adverse health consequences than do other emergency service personnel.<sup>35</sup> Also, limited evidence tends to suggest that volunteers are more likely to develop post-traumatic changes in health and welfare compared to trained staff.<sup>3,36</sup> This may reflect the impact of stringent selection, higher levels of training, and better peer support with regard to trained personnel. Paton emphasizes the importance of the training, selection, and preparation of first responders to promote well being as well as operational effectiveness.<sup>37</sup> However, the perceptions and expectations of first responders also must be considered. Eidelson's team suggested that being a volunteer in a disaster zone may encourage the reporting of more positive outcomes because that work offers them a particularly meaningful dimension, whereas for professionals, it may be just "a job".<sup>38</sup>

#### *Body Search and Handling*

In a three-month follow-up of Navy divers deployed to retrieve bodies from an air crash, no symptoms of PTSD were found.<sup>39</sup> Similarly, in a unique study of search-and-rescue canine handlers used after the World Trade Center attacks, a high level of resilience with few signs of psychological disturbance were observed.<sup>40</sup> Alexander reported that, from a matched controlled, longitudinal study (with a three-month and three-year follow-up) of a cohort of police body handlers after the Piper Alpha oil platform disaster, no officer displayed any signs of a post-traumatic psychopathology. The few officers who displayed signs of an affective disorder and substance misuse already had shown these signs in a pre-disaster occupational health survey.<sup>41</sup> Tucker and his colleagues reported a similar outcome among first responders involved in the Oklahoma terrorist bombing.<sup>42</sup> The low level of psychopathology in the last study is particularly noteworthy because these responders were relatively inexperienced and came from the same community as did many of the dead.

These findings, with regard to body recovery, pose a challenge in terms of how to interpret them because earlier researchers, such as Taylor and Frazer, emphasized that such duties can be emotionally damaging even to experienced personnel.<sup>43</sup>

#### *Positive Outcomes*

As Tedeschi and Kilmer noted, historically, disaster research has concerned itself with the undesirable experiences and effects associated therewith.<sup>44</sup> However, a fundamental and important concern also has been raised by Summerfield regarding the disproportionate emphasis on vulnerability rather than on resilience.<sup>45</sup> More recently, a new focus has emerged—one that highlights well-being, personal growth, and resilience.<sup>44</sup> During and subsequent to the outbreak of severe acute respiratory syndrome (SARS) in Hong Kong in 2003, frontline health workers reported that, while experiencing some negative effects of their work (including "survivor guilt"), their work also generated a number of positive reactions including a revision of their life values and priorities, and a deepening of relationships.<sup>46</sup> In a three-year follow-up study of police body han-

dlers involved in the oil platform disaster, Alexander also identified positive outcomes.<sup>41</sup> More than three quarters of the officers were glad to have been members of the body handling team; 88% claimed that such work would be of benefit to them in their future police careers; and 71% would volunteer for such duties again. Similarly, by means of detailed interviews of body handlers who had dealt with three different disasters, McCarroll and colleagues observed that these personnel generally were proud of what they had achieved, and felt reassured that other individuals would not have been able to cope with such work.<sup>47</sup>

### Factors that Exacerbate or Mitigate Adverse Effects

#### *At-Risk and Vulnerability and Resilience Factors*

How individuals react to disasters cannot be explained by simple, reductionist models based mainly on the severity and nature of the stressor. Alexander highlighted sophisticated models that have been constructed to emphasize cognitive/informational factors, biological factors, and the principles of conditioning.<sup>24</sup> Currently, none are pre-eminent. However, these models aim to answer challenging and important questions such as why some survivors react adversely (but differently) to major stressors, while others display remarkable resilience and personal growth. Why do certain post-traumatic psychopathologies develop along a chronic trajectory, whereas for others, these pathologies are no more than an acute, self-limiting reaction or even have a delayed onset? Finally, why is it that some individuals do not always display a consistency of response to different trauma; they appear to cope with one type of incident but cannot do so successfully with another.

Research findings that reflect on these questions are considered under three sub-headings: (1) pre-disaster factors; (2) peri-traumatic factors, and (3) post-disaster factors.

*Pre-Disaster Factors*—Witteveen *et al* reviewed the relative contribution of pre-disaster factors in relation to the outcome for first responders after a disaster, and emphasized the negative associations of being single, older, female, and of lower educational level.<sup>48</sup> From a survey of >300 trauma nurses and surgeons, Alexander and Atcheson confirmed that, contrary to expectation, it was the senior and female staff who were more likely to admit to the emotional impact of their trauma work.<sup>49</sup> In another Scottish study of paramedics, features of burnout were reported most commonly by those with longer service.<sup>50</sup> However, some of these findings are, by no means, consistent.<sup>22</sup> Armagan *et al* found no age or gender differences in the prevalence of PTSD among Turkish Red Crescent workers.<sup>12</sup> First responders from ethnic minorities may be more vulnerable to the psychological damage of disaster work because they also may have to endure discrimination at work and at home.<sup>51</sup>

Certain pre-disaster variables also may be protective of caregivers. For example, training in disaster work has been described as a prophylaxis against psychological damage,<sup>39,48</sup> and selection (organizational and self) may ensure that recruitment of first responders identifies those most likely to be resilient.<sup>18</sup> The personality trait, “hardiness”, has emerged from several research studies as one that determines how well first responders cope with their disaster

duties.<sup>52</sup> “Hardy” persons view events as largely under their own control; as a challenge rather than as a threat; and as meaningful rather than merely capricious and pointless. However, in a rare study of the effects of disaster work on chaplains and the clergy, Roberts *et al* found that religion had no effect on the likelihood of developing “compassion fatigue”.<sup>53</sup>

Brown *et al* suggest that first responders who believe they have little control over events (i.e., they have an “external locus of control”) fare less well compared to those with an “internal locus of control” (i.e., those who believe they can influence outcomes).<sup>54</sup> However, this association between post-traumatic mental health and adjustment problems on the one hand, and locus of control on the other hand, may be mediated by the severity of the disaster. An internal locus of control may become less influential the more severe the trauma.

Despite much interesting research, it is not yet possible to formalize guidelines with persuasive predictive validity based on pre-disaster factors.

*Peri-Disaster Factors*—As mentioned previously, body handling can have disturbing effects on first responders. A key factor that might underlie the adverse psychological impact of dealing with human remains is the extent to which body handlers identify with the deceased.<sup>55</sup> Handling the bodies of children is almost universally abhorred by first responders,<sup>56</sup> and this circumstance may represent the impact of first responders identifying more with the parents of the dead children rather than with the dead themselves. Other disaster-related factors that seem to increase the likelihood of psychological problems are: (1) a human-caused disaster rather than one from a naturally occurring event; (2) feeling unsafe in the disaster zone; (3) the development of an empathic attitude to survivors; (4) experiencing helplessness in the disaster zone; (5) the intensity of exposure to traumatic scenes; and (6) developing either an acute stress disorder or dissociative reaction during the event.<sup>23,29,57-60</sup> However, dissociation (a reaction associated with feeling numb and a sense of unreality) may have a complex relationship with longer term adjustment, as it seems to afford first responders with a degree of initial psychological protection, but may also be associated with longer term problems of adjustment.<sup>61</sup>

Certain peri-traumatic factors appear to be consistently protective against the adverse impact of disaster work. These include: (1) good organization; (2) a clear definition of duties; (3) attention to personal physical needs; (4) teamwork; and (5) a sense of being appreciated.<sup>62,63</sup> Also, it has been noted that the unpleasant effect of dealing with human remains may be countered by the attempts of the workers to distance themselves from the deceased by not looking at their faces; by not learning the name or personal details of the deceased that would confirm their “humaneness”.<sup>47</sup> Distancing also may be achieved by physical barriers such as the use of masking oils for offensive odors and wearing protective clothing and gloves. Other first responders have found it helpful to “reframe” their work by translating it into something positive and meaningful rather than experiencing it as something unpleasant and to be

avoided.<sup>42</sup> “Black humor” has been accredited with a protective role, particularly in the face of death.<sup>62</sup> However, it does not seem to be used in response to dead children, and is much less likely to be used by female than male personnel.<sup>49</sup> A sense of altruism and commitment also may be protective for first responders, although McCarroll *et al* highlight the risks of over-dedication.<sup>47</sup>

There is no evidence that any single method of coping guarantees immunity against the adverse effects of disaster work. Moreover, it may be anticipated that any particular method of coping, such as denial, may be useful in one setting, or at some particularly time in the disaster situation, but be contraindicated in other settings or at different stages of the disaster.

*Post-Disaster Factors*—As emphasized by Witteveen and colleagues, first responders commonly are exposed to numerous, extended sequelae of a disaster; these may involve media interest and lengthy and often adversarial legal proceedings.<sup>48</sup> There also may be an additive effect because upon completion of their disaster duties, first responders frequently return to routine operational duties during which they may be further exposed to other disturbing and potentially overwhelming events. Alexander and Klein reported on the complex interaction between coping and serial exposure to disturbing events.<sup>50</sup> While for some paramedics, further exposure to trauma had an inoculating or rewarding effect, for about 10% of their colleagues, further exposure had a debilitating effect, and lowered their level of subsequent coping.

An important factor occurring after a disaster that may compromise the emotional welfare and functioning of first responders is their personal experience of unrelated stressful life events.<sup>64</sup> Post-disaster stressors are particularly important to identify in communities exposed to additional adversities, such as those in Sri Lanka and Pakistan: each has had to cope with terrorist attacks after the tsunami and earthquake, respectively. This observation underscores the need for the longer term monitoring of the welfare of first responders once they have completed their disaster work. Some personnel may be troubled persistently by prolonged fears of contamination, as was the case after the Exxon Valdez chemical spill,<sup>65</sup> the Chernobyl nuclear explosion,<sup>10</sup> and the Bijlmeemeer air crash, in which it had been suspected (wrongly) that the aircraft had been carrying radioactive materials.<sup>30</sup>

#### *Post-Incident Provision*

The best ways to assist first responders after an incident remain the subject of much debate. Generally, it is accepted that providing opportunities for them to discuss their experiences informally with friends, family and colleagues is helpful, and that personal help should be delivered in a low-key fashion.<sup>31</sup>

Critical Incident Stress Debriefing (CISD) inspired early promise in assisting responders,<sup>66</sup> but having reviewed the evidence-based literature, the National Institute for Clinical Excellence (NICE), states that the empirical data are largely negative, i.e., CISD either has no effect or can worsen the situation in individuals through iatrogenic effects.<sup>67</sup> In particu-

lar, mandatory, one-off CISD sessions are not recommended, because they may be psychologically injurious to those individuals who are not yet ready to rehearse their own traumatic experiences or to hear those of their colleagues.<sup>68,69</sup> This is in accord with the principal advocates of CISD who have long insisted that single sessions of CISD are not desirable; they should be merely an element in an overall scheme of care provision, Critical Incident Stress Management (CISM).<sup>70</sup>

Trauma Risk Management (TRiM) is a relatively new program adapted by the military and some emergency services.<sup>71</sup> Provided by trained colleagues, it is a method of assessing personnel after a single-event trauma, at three- and 28-days post-incident, to determine who may be at risk of developing post-traumatic conditions, and may require referral to specialized care. Unlike CISD, it does not require the participants to describe their traumatic experiences in detail, thereby minimizing the risk of retraumatization. Although it shows some promise and seems to be welcomed by participants, rigorous evaluation is awaited.

Consistently, investigators have emphasized the value of post-disaster support for first responders.<sup>48</sup> How they view the quality and value of that support may, in turn, be influenced by the impact of the disaster. Many first responders do not readily seek help, claiming, for example, that they do not need it or they are not worthy of it because they are not the real “victims”. It was noted that the extent to which Red Cross workers made use of the mental health services available after the World Trade Center attacks was linked to pre-disaster variables. Those who accessed these services were more likely to: (1) have had no previous psychiatric history; (2) be younger; and (3) have been divorced or widowed.<sup>72</sup>

An intervention that is more likely to commend itself to first responders is “Psychological First Aid” (PFA).<sup>2</sup> It lacks psychiatric labeling, addresses first essential physical needs (e.g., safety, food, and communication with family, friends and others), helps to facilitate normal individual and group methods of coping, and normalizes emotional responses.

Research data consistently support the view that while they commonly experience emotional distress, first responders, do not generally develop genuine psychopathology post-disaster.<sup>69</sup> However, some do, and may be identified by means of TRiM<sup>71</sup> or triage through PFA.<sup>2</sup> Much research, particularly with regard to PTSD and Acute Stress Disorder (ASD), identifies trauma-focused cognitive behavioral and Eye Movement Desensitization and Reprocessing (EMDR) therapies as the treatments of choice for all eviating and delimiting the effects of post-traumatic symptoms.<sup>73–75</sup> The NICE Guidelines<sup>67</sup> do not distinguish between these two therapies for the treatment of PTSD. Therefore, research opportunities for head-to-head comparisons involving these interventions remain,<sup>76</sup> particularly in regard to the possibility that refinements might be of value to the specific requirements of first responders.

Care providers also have the responsibility of caring for themselves. Palm and colleagues identified a number of useful self-help measures, including spending time with families, striking a balance between work and personal lives, and avoiding being exposed repeatedly to reminders of the disaster through the media.<sup>5</sup>

### Areas of Research Requiring Further and More Rigorous Empirical Enquiry

The difficulties of conducting post-disaster research have been identified elsewhere, as have the challenging ethical issues.<sup>14,77</sup> These difficulties include insufficient time to prepare an elegant research protocol, and the ethical conflict associated with the need to obtain valuable research data that may further distress those who have endured a disturbing event. However, some reassurance can be gained from the finding that carefully conducted and purposeful research may not inevitably upset survivors further, but on the contrary, may have a healing effect.<sup>78</sup>

Quality research involving first responders is essential to gain a better understanding of: (1) the association among pre-, peri- and post-disaster phenomena; (2) what kinds of training and selection are effective in identifying those most suitable as first responders; (3) what are the most effective psychoprophylaxes (e.g., through selection, training, and post-incident interventions) against the adverse effects of dealing with disasters (in so far as they are preventable); and (4) how we can best develop and sustain resilience among these personnel.

To raise the quality of research on first responders, prospective investigators must address a number of issues. For example, too many projects involve small samples of questionable representativeness, thereby delimiting the generalizability of any conclusions.<sup>79</sup> Most studies are cross-sectional and are reliant on retrospective and self-reported data. Prospective studies involving other sources of information (e.g., from work and health records, and colleagues and families) are needed. Even the validity of the reported duties during disasters may need to be checked, as has been confirmed by the enquiries of Keane *et al*, which showed that there often is poor agreement between the reporting by combat veterans of their military experience and objective records of their experience.<sup>80</sup> A related concern has been raised by Wessely *et al* in regard to the stability of traumatic military recollections over time.<sup>81</sup> The use of suitable control and comparison groups is required to highlight causal relationships and put the observations made on first responders in perspective.

The selection of the measures of predictor variables, effects, and outcomes is limited by the lack of culturally sensitive and standardized measures that can be used across events and groups. Summerfield has appropriately challenged the value of transporting measures developed in

Western cultures into quite different socio-cultural domains following disasters, without backward translation and appropriate re-validation.<sup>82</sup> The absence of such tailored measures makes inter-group and inter-event comparisons of limited value.

There also has been an unhelpful preoccupation with PTSD, resulting in fewer data on other post-traumatic conditions. The effects of disaster work must be considered in relation to outcome measures other than those of psychomorbidity. These include: (1) the first responders' relationships (peer, family, and social); (2) their self-confidence and self-esteem; (3) team and group cohesiveness; (4) the augmentation of coping skills; and (5) subsequent work performance and satisfaction therewith. Long-term follow-up studies are not performed frequently (in part due to cost), but are necessary to identify the long-term trajectories of adjustment and recovery, and to identify psychopathologies and other adverse outcomes that may have a delayed onset.

### Conclusions

The impact of disaster work on various categories of first responders is an important health and welfare issue. Organizations have a moral responsibility to consider the welfare of such personnel, but increasingly, a formal "duty of care" has been enshrined in law.

There is a growing body of evidence confirming that the resilience of first responders is augmented by selection, training, preparedness, personality factors, and good organizational and managerial practices, but more work is required to identify the potency of the specific elements of these broad headings.

There are certain "at-risk and vulnerability" factors conducive to adverse health and functioning that are identified before, during, and after a disaster. Practitioners and managers should be aware of these.

To develop a better understanding of the effects of responding to disasters, greater efforts are required to enhance the quality of research, despite the inherent difficulties and obstacles. More research must be dedicated to ensure that aftercare provisions for first responders meet their needs in a fashion and at a time that is most beneficial to them and does not retraumatize them or compromise their own coping methods. It also is important that efforts introduced to help first responders do not pathologize normal post-traumatic reactions.

### References

1. Sundnes KO, Birnbaum ML (eds): Health and Disaster Management Guidelines for Evaluation and Research in the Utstein Style. *Prehospital Disast Med* 2003;17(Suppl 3):1-177.
2. Raphael B: *When Disaster Strikes. How Individuals and Communities Cope with Catastrophe*. New York: Basic Books, 1986.
3. Dyregrov A, Kristoffersen JJ, Gjestad R: Voluntary and professional disaster workers: Similarities and differences in reactions. *J Trauma Stress* 1996;9:541-555.
4. McFarlane AC, Bryant RA: Post-traumatic stress disorder in occupational settings: Anticipating and managing the risk. *Occup Med* 2007;57:404-410.
5. Palm KM, Polusny MA, Follette VM: Vicarious traumatization: Potential hazards and interventions for disaster and trauma workers. *Prehospital Disast Med* 2004;19:73-78.
6. McCann L, Pearlman LA: Vicarious traumatization: A framework for understanding the psychological effects of working with victims. *J Trauma Stress* 1990;3:131-49.
7. Figley CR: *Compassion Fatigue: Coping with Secondary Traumatic Stress Disorder in Those Who Treat the Traumatized*. New York: Brunner/Mazel, 1995.
8. Maslach C, Jackson SE: Burnout in Health Professions. In: Sanders GS, Suls J (eds), *Social Psychology of Health and Illness*. 3rd ed. Hillsdale NJ: Lawrence Erlbaum, 1982, pp 227-251.
9. Ozen S, Sir A: Frequency of PTSD in a groups of search and rescue workers two months after 2003 Bingol (Turkey) earthquake. *J Nerv Ment Dis* 2004;192:573-575.
10. Viel JF, Curbakova E, Dzerve B, *et al*: Risk factors for long-term mental and psychosomatic distress in Latvian Chernobyl liquidators. *Environ Health Perspect* 1997;105:1539-1544.
11. Nickeil LA, Crichton EJ, Tracy CS, *et al*: Psychosocial effects of SARS on hospital staff: Survey of a large tertiary care institution. *Can Med Assoc J* 2004;170:793-798.

12. Armagan E, Engindeniz Z, Devay AO, et al: Frequency of post-traumatic stress disorder among relief force workers after the tsunami in Asia: Do rescuers become victims? *Prehospital Disast Med* 2006;21:168–172.
13. Bilal MS, Rana MH, Rahim S, et al: Psychological trauma in a relief worker—A case report from earthquake-struck areas of Northern Pakistan. *Prehospital Disast Med* 2007;22:458–461.
14. Klein S, Alexander DA: Post-Disaster Research Issues. In: Niaz U (ed), *Pakistan Earthquake 2005: The Day the Earth Moved*. Karachi: Sama Publishing and Editorial Services, 2007, pp 233–263.
15. Stewart SH, Mitchell TL, Wright KD, et al: The relations of PTSD symptoms to alcohol use and coping drinking in volunteers who responded to the Swissair Flight 111 airline disaster. *J Anxiety Disord* 2004;18:51–68.
16. Alexander DA, Walker LF, Sinclair SD, et al: *Police Stress at Work*. London: Police Foundation, 1993.
17. Boxer PA, Wild D: Psychological distress and alcohol use among fire fighters. *Scand J Work Environ Health* 1993;19:121–125.
18. North CS, Tivis L, McMillen JC, et al: Psychiatric disorders in rescue workers after the Oklahoma City bombing. *Am J Psychiatry* 2002;159:857–859.
19. American Psychiatric Association: *Diagnostic and Statistical Manual (4th Edition)*. Washington DC: American Psychiatric Association, 1994.
20. World Health Organization: *The ICD-10 Classification of Mental and Behavioural Disorders*. Geneva: World Health Organization, 1992.
21. Engelhard IM, van den Hout MA, Weerts J, et al: Deployment-related stress and trauma in Dutch soldiers returning from Iraq: Prospective study. *Br J Psychiatry* 2007;191:140–145.
22. Morrén M, Yærmans CJ, van Nispen RMA, et al: The health of volunteer fire fighters three years after a technological disaster. *J Occup Health* 2005;47:523–532.
23. Norris FH, Friedman MJ, Watson PJ: Disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry* 2002;65:207–260.
24. Alexander DA: Trauma research: A new era. *J Psychosom Res* 1996;41:1–5.
25. Klein S, Alexander DA: Epidemiology and presentations of post-traumatic disorders. *Psychiatry* 2006;5:225–227.
26. Sims A, Sims D: The phenomenology of post-traumatic stress disorder. A symptomatic study of 70 victims of psychological trauma. *Psychopathology* 1998;31:96–112.
27. Galea S, Nardi A, Vlahov D: The epidemiology of post-traumatic stress disorder after disasters. *Epidemiol Rev* 2005;27:78–91.
28. Liao SC, Lee MB, Lee YJ, et al: Association of psychological distress with psychological factors in rescue workers within two months after a major earthquake. *J Formos Med Assoc* 2002;101:169–176.
29. Fullerton CS, Ursano RJ, Wang L: Acute stress disorder, posttraumatic stress disorder, and depression in disaster or rescue workers. *Am J Psychiatry* 2004;161:1370–1376.
30. Huizink AC, Slottje P, Witteveen AB, et al: Long term health complaints following the Amsterdam Air Disaster in police officers and fire fighters. *Occup Environ Med* 2006;63:657–662.
31. Dowling FG, Moynihan G, Genet B, et al: A peer-based assistance program for officers with the New York City Police Department: Report of the effects of Sept. 11, 2001. *Am J Psychiatry* 2006;163:151–153.
32. Yeh CB, Leckman JF, Wan FJ, et al: Characteristics of acute stress symptoms and nitric oxide concentration in young rescue workers in Taiwan. *Psychiatry Res* 2002;112:59–68.
33. Morrén M, Dirkwagner AJE, Kessels FJM, et al: The influence of a disaster on the health of rescue workers: A longitudinal study. *CMAJ* 2007;176:1279–1283.
34. Marmar CR, McCaslin SE, Metzler TJ, et al: Predictors of posttraumatic stress in police and other first responders. *Ann NY Acad Sci* 2006;1071:1–18.
35. Marmar CR, Weiss DS, Metzler TJ, et al: Stress responses of emergency services personnel to the Loma Prieta earthquake Interstate 880 freeway collapse and control traumatic incidents. *J Trauma Stress* 1996;9:63–85.
36. Hagh-Shenas H, Goodazi MA, Dehbozorgi G, et al: Psychological consequences of the Bam earthquake on professional and non-professional helpers. *J Trauma Stress* 2005;18:477–483.
37. Paton D: Training disaster workers: Promoting wellbeing and operational effectiveness. *Disaster Prevent Manag* 1996;5:11–18.
38. Eidelson RJ, D'Alessio GR, Eidelson JI: The impact of September 11 on psychologists. *Profess Psychol: Research and Practice* 2003;34:144–150.
39. Leffler CT, Dembert ML: Posttraumatic stress symptoms among US Navy divers recovering TWA flight 800. *J Nerv Ment Dis* 1998;186:574–577.
40. Alvarez J, Hunt M: Risk and resilience in canine search and rescue handlers after 9/11. *J Trauma Stress* 2005;18:497–505.
41. Alexander DA: Stress among body handlers: A long-term follow-up. *Br J Psychiatry* 1993;163:806–808.
42. Tucker P, Pfefferbaum B, Doughty DE, et al: Body handlers after terrorism in Oklahoma City: Predictors of posttraumatic stress and other symptoms. *Am J Psychiatry* 2002;72:469–475.
43. Taylor A, Frazer A: The stress of post-disaster body handling and victim identification. *J Human Stress* 1982;8:4–12.
44. Tedeschi RG, Kilmer RP: Assessing strengths, resilience, and growth to guide clinical interventions. *Professional Psychology Research and Practice* 2005;36:230–237.
45. Summerfield D: Survivors of the tsunami: Dealing with disaster. *Psychiatry* 2006;5:255–256.
46. Tam CWC, Pang EPF, Lam LCW, et al: Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: Stress and psychological impact among frontline healthcare workers. *Psychol Med* 2004;34:1197–1204.
47. McCarroll JE, Ursano RJ, Wright KM, et al: Handling bodies after violent death. *Am J Orthopsychiatry* 1993;63:209–214.
48. Witteveen AB, Bråmsen I, Twisk JWR, et al: Psychological distress of rescue workers eight and one-half years after professional involvement in the Amsterdam air disaster. *J Nerv Ment Dis* 2007;195:31–40.
49. Alexander DA, Atcheson SF: Psychiatric aspects of trauma care: Survey of nurses and doctors. *Psych Bull* 1998;22:132–136.
50. Alexander DA, Klein S: Ambulance personnel and critical incidents: Impact of accident and emergency work on mental health and emotional well-being. *Br J Psychiatry* 2001;178:76–81.
51. Perilla JL, Norris FJ, Lavizzo E: Ethnicity, culture and disaster response: Identifying and explaining ethnic differences in rescue workers after the Oklahoma City bombing. *Am J Psychiatry* 2002;159:857–859.
52. Maddi SR, Kobasa SC: *The Hardy Executive: Health Under Stress*. Homewood, Ill: Dow Jones-Irwin, 1984.
53. Roberts SB, Flannelly KJ, Weaver AJ, et al: Compassion fatigue among chaplains, clergy, and other respondents after September 11th. *J Nerv Ment Dis* 2003;191:756–758.
54. Brown J, Mulhern G, Joseph S: Incident-related stressors, locus of control, coping and psychological distress among fire fighters in Northern Ireland. *J Trauma Stress* 2002;15:161–168.
55. Cetin M, Kose S, Ebrinc S, et al: Identification and posttraumatic stress disorder symptoms in rescue workers in the Marmara, Turkey, earthquake. *J Trauma Stress* 2005;18:485–489.
56. Ursano RJ, McCarroll JE: The nature of a traumatic stressor: Handling dead bodies. *J Nerv Ment Dis* 1990;178:396–398.
57. Fullerton CS, Ursano RJ, Reeves J, et al: Perceived safety in disaster workers following 9/11. *J Nerv Ment Dis* 2006;194:61–63.
58. Regehr C, Goldberg G, Hughes J: Exposure to human tragedy, empathy, and trauma in ambulance paramedics. *Amer J Orthopsychiatry* 2002;72:505–513.
59. Bryant RA, Harvey AG: Post-traumatic reactions in volunteer fire fighters. *J Trauma Stress* 1996;9:51–62.
60. Ozer EJ, Best SR, Lipsey TL, et al: Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychol Bull* 2003;129:52–73.
61. Rundell JR: Assessment and Management of Medical-Surgical Disaster Casualties. In: Ursano RJ, Fullerton CS, Weisath L, Raphael B (eds), *Textbook of Disaster Psychiatry*. Cambridge: Cambridge University Press, 2007, pp 164–189.
62. Alexander DA, Wells A: Reactions of police officers to body-handling after a major disaster: A before-and-after comparison. *Br J Psychiatry* 1991;159:547–555.
63. Thompson J, Solomon M: Body recovery teams at disasters: Trauma or challenge? *Anxiety Res* 1991;4:234–244.
64. McCaslin SE, Jacobs GA, Meyer DL, et al: How does negative life change following disaster response impact distress among Red Cross responders? *Profess Psychol: Research and Practice* 2005;36:246–253.
65. Arata CM, Picou JS, Johnson G, et al: Coping with technological disaster: An application of the conservation of resources model to the Exxon Valdez oil spill. *J Trauma Stress* 2000;13:23–39.
66. Mitchell J: When disaster strikes: The critical incident stress debriefing procedure. *J Emerg Med Serv* 1983;8:36–39.
67. National Institute for Clinical Excellence: Post-traumatic Stress Disorder (PTSD): *The Management of PTSD in Adults and Children in Primary and Secondary Care*. London: National Collaborating Centre for Mental Health, 2005.
68. Raphael B, Wooding S: Debriefing: Its evolution and current status. *Psychiatry Clin North Am* 2004;27:407–423.
69. Gray MJ, Maguen S, Litz BT: Acute psychological impact of disaster and large-scale trauma: Limitations of traditional interventions and future practice recommendations. *Prehospital Disast Med* 2004;19:64–72.
70. Everly GS, Mitchell JT: *Critical Incident Stress Management (CISM): A New Era and Standard of Care in Crisis Management*. Ellicott City, MD: Chevron, 1997.

71. Greenberg N, Cawkill P, March C, *et al*: How to TRiM away at post traumatic stress reactions: Traumatic risk management—Now and the future. *J R Nav Med Serv* 2005;91:26–31.
72. Elhai JD, Jacobs GA, Kashdan TB, *et al*: Mental health service use among American Red Cross disaster workers responding to the September 11, 2001 U.S. terrorist attacks. *Psychiatry Res* 2006;143:29–34.
73. Bryant RA, Moulds ML, Nixon RVD: Cognitive behaviour therapy of acute stress disorder: A four-year follow-up. *Behav Res Ther* 2003;41:489–494.
74. Harvey AG, Bryant RA, Tarrier N: Cognitive behaviour therapy for post-traumatic stress disorder. *Clin Psychol Rev* 2003;23:501–522.
75. Walsler RD, Ruzek JI, Naugle AE, *et al*: Disaster and terrorism: Cognitive-behavioural interventions. *Prehospital Disast Med* 2004;19:54–63.
76. Seidler GH, Wagner FE: Comparing the efficacy of EMDR and trauma-focused cognitive-behavioural therapy in the treatment of PTSD: A meta-analytic study. *Psychol Med* 2006;36:1515–1522.
77. Dominici F, Levy JI, Louis TA: Methodological challenges and contributions in disaster epidemiology. *Epidemiol Rev* 2005;27:9–12.
78. Griffin MG, Resick RA, Waldrop AE, *et al*: Participation in trauma research: is there evidence of harm? *J Trauma Stress* 2003;16:221–227.
79. Huizink AC, Smidt N, Twisk JWR, *et al*: Epidemiological disaster research: The necessity to include representative samples of the involved workers. Experience from the epidemiological study air disaster Amsterdam—ESADA. *J Epidemiol Community Health* 2006;60:887–889.
80. Keane T, Fairbank J, Caddell K, *et al*: Clinical evaluation of a measure to assess combat exposure. *J Consult Clin Psychol* 1989;1:53–55.
81. Wessely S, Unwin C, Hotopf M, *et al*: Stability of recall of military hazards over time. *Br J Psychiatry* 2003;183:314–322.
82. Summerfield D: Cross-Sectional Perspectives on the Medicalization of Human Suffering. In: Rosen GM (ed), *Posttraumatic Stress Disorder: Issues and Controversies*. New York: Wiley, 2004, pp 233–245.