Parental Exposure to Mass Violence and Child Mental Health: The First Responder and WTC Evacuee Study

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Abstract Children's reactions after being exposed to mass violence may be influenced by a spectrum of factors. Relatively unexplored is the extent to which family exposure to mass violence may affect child mental health, even when these children have not been directly exposed. In a representative sample of NYC public school children assessed 6 months after the September 11, 2001 attack on the World Trade Center (WTC), seemingly elevated rates of psychopathology were recorded among children of WTC evacuees. Children of NYC First Responders (police officers, EMTs, and fire fighters) displayed a complex pattern of response to the WTC attack. Overall, the findings from this previous study support putative transmission of trauma to children whose parents were exposed to the WTC attack. The "Children of First Responder and WTC Evacuee Study"—a two-site longitudinal study—is currently underway in the United States (New York City) and in Israel (Tel Aviv area) in an effort to understand the impact of different patterns of mass violence. The NYC sample permits us to examine the impact of a rare instance of mass violence (e.g., WTC attack), while the Israeli sample provides information about

repeated and frequent exposure to mass violence brought about by acts of terrorism. In addition, children's exposure to mass violence is considered in the context of their exposure to other potentially traumatic events. This study aims to improve our general understanding of the impact of mass violence on children, especially the psychological effects on children whose parents' work experiences are by nature stressful. Knowledge generated by this study has implications for guiding efforts to meet the needs of children who have, directly or through a family member, been subjected to rare or infrequent mass violent event as well as to children whose exposure to mass violence is part of daily life.

Keywords First Responder · PTSD · Trauma · Mass violence · Child mental health

Ample demonstration has now led to widespread recognition of the adverse consequences endured by large numbers of adults and children, who during their lifespan have been exposed to traumatic events and scarred by their experience (Breslau 2001; Pynoos 1994). An adult's exposure to a traumatic event may also put their indirectly exposed dependent children as well as other nonexposed adults at second-hand risk for psychopathology. The majority of investigations as regards this potential outcome have important limitations. For the most part, studies have focused on the reactions of children to one specific potentially traumatic event, and rarely such experience is contextualized within other events which are part of a child's life. We describe in this paper the design and preliminary findings informing a study (the First Responder and WTC Evacuee Study) focused on children's response to parental exposure to mass violence.

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First, it must be specified as to how one defines a “violent event,” “mass violent event,” “traumatic event,” or “disaster.” These terms are often used imprecisely. Our particular interest is events related to terrorism or war, which we describe as “mass violent events” or “man-made disasters.” (The exposed samples in our First Responder and WTC Evacuee Study were all directly exposed to the attacks of 9/11.) Mass violence, however, is examined in the context of other potentially traumatic mass events, such as major fires or natural disasters, as well as potentially traumatic events on an individual level, which may be violent (such as a shooting or a car crash), or nonviolent (such as the sudden, nonviolent death of a loved one). We are, in fact attempting to further understand the contribution of different types of event to the development of psychopathology by children after a mass traumatic event. Violent events can be classified by a number of criteria. Events which affect one individual at one specific time are frequently classified according to where the violence occurred (e.g., home, community, or school). In situations where groups of people are likely to be simultaneously exposed to an event, events are usually classified based on their source cause (e.g., natural disasters or human-caused disasters). Research to date has not adequately distinguished the development of psychopathology in the aftermath of mass traumatic events compared to such development in instances affecting isolated individuals. We believe that a focus on mass violent events is warranted. The social nature of being caught up in a mass violent experience may have a unique impact on the development of psychopathology than the experiencing of violent trauma individually or the involvement in a mass traumatic event which is not violent.

A limitation of prior studies which should be mentioned is that most of them have been focused on measuring solely one condition, post-traumatic stress disorder (PTSD), as it is the psychiatric condition most often considered to be directly related to exposure to mass events or to personal, more privately experienced instances of violence or stress. However, it is now also known from a number of studies that other psychiatric disorders including other anxiety disorders and depression, while not as commonly studied as PTSD, are frequently associated with exposure to violence (Hoven et al. 2004, 2005; Kendler et al. 1992). Moreover, post-traumatic stress responses to violence are frequently co morbid with depression (Vizek-Vidovic et al. 2000) and anxiety (Asarnow et al. 1999; Goenjian et al. 2001). Unfortunately, few longitudinal investigations having the potential to reveal the course of development of these disorders, have been undertaken, which, naturally, limits our ability to design post-disaster prevention and intervention efforts intended to address such problems. Studying the impact of exposure to violence on the development of

psychopathology is complex, especially when children who have not been directly exposed are the group of focus.

It is key to elucidate the impact of parental exposure to mass violence on a child’s future development of psychopathology. It is important that such impact be considered in the context of other traumatic experiences children and parents may have been exposed to. Understanding the mechanisms involved in the transmission of mass trauma experienced by parents to their children would greatly improve our capacity to understand children’s response to trauma in general. Furthermore, findings from this line of research are the key to target and serve populations who are in need, by informing the design of appropriate interventions which can be quickly implemented in a post-mass violence context. Elucidating the impact of direct parental exposure to mass violence on the mental health of their unexposed children is, therefore, our main goal. To accomplish this goal, we start by compiling the existing literature on related issues. We begin by summarizing findings on relevant factors that influence children’s responses to exposure to violence and other traumatic events. Next, we examine evidence of the specific impact of family exposure on children, suggesting possible mechanisms for this transmission. Subsequently we report on studies of trauma exposure experienced by First Responders (FRs). First Responders, by the unique nature of their work and type of trauma they are exposed to, constitute a particularly interesting group from which to obtain information about the response of children to familial exposure to potentially traumatic events, many of them of violent nature.

We next present original analyses of a representative sample of NYC public school children assessed 6 months after September 11, 2001, focusing on children whose parents were World Trade Center (WTC) evacuees, as well as children who, on September 11, 2001 had family members who were First Responders (police officers, EMTs, and fire fighters). From these original data, we adduce evidence supporting the relationship of family exposure to child psychopathology. These findings lead us to refine our questions and design the methodology utilized in our “Children of First Responder and WTC Evacuee Study”—a two-site longitudinal study, being conducted in the United States (New York City) and in Israel (Tel Aviv area)—which is intended to distinguish between the two venues, so as to better understand the subsequent effect on children of different patterns of mass violence, that is, terrorism. This study is expected to improve our understanding of the impact of mass violent disasters on children. The NYC sample provides an opportunity to examine the impact of relatively rare and isolated incidents of mass violence, like the WTC attack in New York, and contrast it effects with a different pattern of exposure derived from the Israeli sample, thus, permitting a comparison between effects of rare to

frequent and repeated exposure to mass human-caused violence by terrorism. Finally, we point to the implications which flow from an increased understanding of the effects of parental exposure to violence on child adjustment. We expect that the general conceptual framework we have developed and described will, together with new findings from this Children of First Responders and World Trade Center Evacuee Study, contribute to a better general understanding of how parental exposure to traumatic events may impact their children.

Child Psychopathology After Mass Traumatic Events: An Overview

Psychiatric disorders observed in children after large-scale traumatic events include, but are not limited to PTSD, depression, anxiety, and panic disorder. Although numerous studies have examined children's reactions in the aftermath of large-scale disasters, both natural and man-made, occurring in locations throughout world (e.g., Pynoos et al. 1987; Pfefferbaum et al. 1999, 2002; La Greca et al. 1996; Shaw et al. 1996; Goenjian et al. 2001; Thienkrua et al. 2006; Neuner et al. 2006; Kar et al. 2007; Boksztzanin 2007; Sahin et al. 2007), comparing reported prevalence rates is problematic for a number of reasons. Not only do the different intensities of these disasters render such comparisons difficult, they are further complicated because they have occurred in different cultural contexts or milieus, and are assessed using methodologically diverse means. Post-disaster research to date has usually limited its focus to a narrowly defined slice of the population, thereby failing to assess representative samples of the often larger impacted population. For what have been declared "practical" reasons, research efforts have been inclined to concentrate on subgroups that are supposedly the most vulnerable, without first establishing that this supposition is correct. Under such circumstances, comparing rates of psychopathology cited across these studies, in the absence of information which clearly delineates the extent of the destruction and human suffering caused, can turn out to be misleading or even meaningless. For example, in a literature review some of the authors of this article (Hoven et al. 2003) noted that after natural disasters, reported rates of PTSD-related syndromes varied substantially, from 3% in children exposed to a tornado (Stoppelbein and Greening 2000) to 90% in children after exposure to a hurricane (Goenjian et al. 2001).

In general, for all different types of mass disasters, common risk factors for PTSD in children have been found to include the following: proximity to the event, being female and being of younger age (Brener et al. 2002;

Dyregrov et al. 2000; Goenjian et al. 2001; Kitayama et al. 2000; Rothe et al. 2002; Vizek-Vidovic et al. 2000).

The above risks, although found to hold true in numerous disaster events, do not exhaust the spectrum of risk. For example, media exposure to an event has also been shown to be associated with children's post-traumatic reactions (Pfefferbaum et al. 2000; Hoven et al. 2002a). Thus, an important correlate of child PTSD after the Oklahoma City terrorist acts included media exposure (Pfefferbaum et al. 2000); and media exposure was also a factor associated with development of psychopathology after the WTC attack (Hoven et al. 2002b; Saylor et al. 2003). A body of evidence suggests that prior exposure to trauma may also lower the threshold for future negative mental health outcomes and make the development of PTSD a more likely consequence after subsequent exposures. Thus, prior exposure to interpersonal violence or loss of a family member may be more closely related to the development of PTSD than to other types of precipitating traumatic events (Davis and Siegel 2000).

Findings from the few existing longitudinal studies of children's exposure to mass-trauma suggest that children's post-traumatic stress reactions persist over time (Dyregrov et al. 2002; Kitayama et al. 2000; Stein et al. 1999; Udwin et al. 2000; Thabet and Vostanis 2000; McFarlane 1998). For example, a study of the effects of war trauma on Lebanese children showed that they experienced PTSD rates of 43% 10 years after the events (Macksoud et al. 1993). This finding is comparable to a longitudinal study of the survivors of a shipping disaster. Of the 217 surviving children studied, 51.7% developed PTSD and one-third of the cases of PTSD persisted 5 and 8 years after the event (Yule et al. 2000) and rates of general psychopathology remained higher in survivors (Bolton et al. 2000). Interestingly, while it is rare to have the opportunity to examine pre-existing factors, some studies were able to do so (Lengua et al. 2005; Greca et al. 1998b; Khoury et al. 1997; Weems et al. 2007). One study was able to benefit from ongoing data collection, including some at the time of an earthquake, to show that prior anxiety symptoms was the only factor that significantly predicted development of PTSD in children (Asarnow et al. 1999).

PTSD has been shown to persist at high prevalence levels in the Welsh town of Aberfan some 42 years after the terrible destruction of a school building downhill from a coal tip that broke loose, killing 144 persons, 130 of whom were school children (Morgan et al. 2003).

Longitudinal studies also report that childhood trauma has an impact on the response to stress throughout the lifespan. Individuals who are exposed to traumatic experiences or stressors early in life are predisposed to mood and anxiety disorders as adults (Kendler et al. 1992). Long-term mental health effects have been documented as

associated to exposure to different kinds of violence, including familial abuse, traffic accidents, and community violence. Namely, trauma may be a major risk factor for adolescent and adult mental health problems (Terr 1991).

Family Exposure to Mass Traumatic Events and Child Mental Health

High risk for the development of psychopathology has been reported among children of parents exposed to violence and traumatic experiences, independently of the child's own exposure (e.g., Rosenheck and Nathan 1985; Solomon et al. 1988; Yehuda et al. 1998, 2001; Hoven et al. 2005). In this sense, children may be considered as particularly vulnerable to developing mental health problems after exposure to violent events, since, in addition to their own exposure to the traumatic situation, they may also suffer an impact, albeit indirect, from their parents' exposure. Understanding the impact of family exposure to violence and other traumas on children is a necessary prerequisite for formulating effective public health interventions after mass disasters, and is a particularly pertinent issue during times of war and terrorism.

A number of hypotheses that may help to explain the association between parental exposure to traumatic events and their children's reactions have been proposed: diathesis, or the child's biological predisposition, impaired parenting related, for example, to mental health problems, child's modeling from parents' actions, and mutually experienced social milieu, such as SES and inadequate social support, or other environmental exposure or factors (Schwartz et al. 1994).

Studies, examining the effects of parental exposure to disasters on child mental health have not as yet disentangled the possible effects of familial exposure from the other multiple types of exposure within one large-scale disaster, including the possible cumulative effects of multiple exposures and additional traumatic events (see Fig. 1).

Limited empirical evidence, however, does support the notion that familial exposure to different types of trauma

may influence development of child psychopathology. For example, studies focusing on PTSD have documented a higher risk for and prevalence of this condition among the second generation of parents with PTSD (Rosenheck and Nathan 1985; Solomon et al. 1988; Yehuda et al. 1998, 2001). While these results are, for the most part, based on Western youth reports of parental PTSD, the association of PTSD across generations has also been identified in Cambodian refugees now living in the United States (Sack et al. 1995).

Research reveals high correlations of parents' and children's symptoms expressed in the aftermath of mutually experienced mass traumatic events. For instance, after the 1993 bombing of the WTC, levels of distress measured in 22 trapped children correlated with the distress of the children's parents as measured 3 and 9 months following the evacuation of the building (Koplewicz et al. 2002). Two other studies of families forced to evacuate their homes due to natural disasters, report correlations between parents' internalizing symptoms and those of their children (Breton et al. 1993; Earls et al. 1988).

There is a body of empirical evidence which documents and investigates mechanisms which could explain the high sensitivity of children to familial conflict and distress at times of mass disasters (Greca et al. 1998a), among which a wide range of situations, violent and nonviolent are included. One possible explanation is that children tend to emulate and mirror their parents' distress (Swenson et al. 1996). Additionally, the demands placed on parents in such circumstances might generate specific disaster-related reactions. It is also conceivable that a feedback loop is put into play, where parents' distress is triggered by the stressed mental health reactions of their children and by the general increased dependence of children on adults following a mass-disaster (La Greca et al. 1998a). Being a mother has been identified as a risk factor for experiencing greater distress after disasters (Havenaar et al. 1997). It is also known that parents with a psychiatric disorder are more likely to exhibit maladaptive behavior, which is associated with psychiatric symptoms in their children. According to one study, psychiatric disorder in the parent does not in itself predict psychiatric disorder in the child, unless maladaptive behavior is present (Johnson et al. 2001). On the other hand, good family functioning might have protective-stabilizing influences, helping children retain relatively good adaptation even as levels of risk exposure rise (Hammack et al. 2004).

The mechanisms explaining the concentration of post-traumatic psychopathology in families, and the extent at which they are influenced by the type of exposure (violent versus nonviolent) are yet to be determined. Figure 2 displays a conceptual model of how child and/or parent exposure to a violent events (including, but not restricted to

Fig. 1 Familial transmission of mental health problems in the context of mass violence

mass violence) may possibly relate to one another and/or to family factors and lead to child psychopathology.

We hypothesize—and this may be a distinctive characteristic of violent large-scale events, in comparison with nonviolent large-scale events or even other types of potentially traumatic events—that parental exposure to large-scale violent events may constitute, because of its shared qualities—a source of trauma for children even in the absence of direct child exposure or parental behavior change. Violent mass events such as the WTC attack have multiple shared consequences—for Evacuees, loss of the parent's job, was a frequent event; for the FR, loss of colleagues the child may know, massive media coverage and discussion of possible future terrorism. Particularly, for children of First Responders, the experience of a mass violent traumatic event to which a parent had been exposed, may affect children simply by their knowing that their parents will be on the front lines of a future mass violent event such as terrorism.

Can First Responders Help Us to Understand the Impact of Familial Exposure to Violence on Children?

First Responders are not only exposed when responding to mass traumatic events when they occur, but also, in their daily work, as they are routinely faced with acts of violence, extreme risk, and great stress, including exposure to acts of individual, family or community bereavement or violence. Parents working as FRs have extremely high levels of work-related exposure to violent, dangerous, or extremely distressing situations, which can generate mental health problems which, in turn, put their children at high risk for mental health problems (Clohessy and Ehlers 1999; Robinson et al. 1997).

In this context, First Responders, that is police, fire fighters, and emergency medical technicians (EMT) and their families form a distinct set. In addition to their usual everyday exposure, they may also have been exposed to an isolated major event like the WTC attack in NYC; or as in

Israel, to repeated acts of terrorism. For instance, EMTs are exposed to many forms of trauma, both natural or human-caused, from close contact with injured victims to life and death situations (Marmar et al. 1996), like calls regarding fatal road accidents, rescue operations, violent deaths, burns, and other injuries, the most stressful of which involve child death (Clohessy and Ehlers 1999). An additional source of stress experienced by EMTs stems from the inconsistent nature of their work, where they must be ready at a moment's notice enduring the seemingly endless periods of idleness characteristic of irregular shifts (Spitzer and Neely 1992). Hence, their families may be exposed to varied levels of indirect trauma. Duarte et al. (2006) observed that the rate of probable PTSD was highest among children of EMTs (18.9%), lower in children of police officers (10.6%), and least in children of fire fighters (5.6%) following the WTC attacks. In addition, there might be situations where the EMTs' family members may also be in danger, which may lead to avoidant behaviors and prolonged symptoms, thereby further disrupting the EMTs' emotional life. This creates a positive feedback loop whereby traumatic symptoms lead to distancing and avoidance, which in turn lead to prolonged effects of the experienced exposure to the original trauma (Clohessy and Ehlers 1999; Marmar et al. 1996; McFarlane and Bookless 2001).

Unfortunately, only sparse information exists regarding the longitudinal course of reactions to trauma of EMTs. In a 3-year study on a small sample of 13 healthcare workers affected by trauma, Collins and Long (2003) found that the largest life impact was delayed and occurred 1 year after the traumatic event. Furthermore, a British study of EMTs, documented 21% of subjects as having PTSD and an additional 25% with moderate, or moderate-to-severe, partial PTSD symptoms (Clohessy and Ehlers 1999).

Police Officers, too, are frequently involved in high-stress and potentially life-threatening situations, including being on scene or investigating homicides, robberies and other acts of physical aggression, where their own presence poses a threat of injury or death (Carlier et al. 2000; Rivard et al. 2002). Current research indicates that the prevalence

Fig. 2 Children's mental health problems after parental exposure to violent incidents

of PTSD in this group ranges from 2.7% to 13.0% (Carlier et al. 1997; Marmar et al. 1999; McFarlane and Bookless 2001; Rivard et al. 2002; Robinson et al. 1997). They also tend to suffer from sleep disturbances (Mohr et al. 2003), and alcohol use or abuse (Lester 1993; McCafferty et al. 1992; Nordlicht 1979; Richmond et al. 1998). Moreover, research in the United States suggests that their suicide rate is highest of any profession (Lester 1993; McCafferty et al. 1992). Further, avoidant behaviors that develop in this population may cause problems with both the spouse and children (Marmar et al. 1996; McFarlane and Bookless 2001).

Unlike EMTs and police officers, no studies to date have specifically examined children of fire fighters. This is despite the fact that several studies have shown high rates of PTSD in fire fighters, both in the general course of their work and following specific traumatic incidents (McFarlane 1988; McFarlane and Papay 1992; Marmar et al. 1999; Myles et al. 1990; Corneil et al. 1999; Murphy et al. 1999). One study found that 90% of urban fire fighters in the United States had experienced at least one traumatic incident over the course of 1 year; of those exposed, the mean was over six incidents (Corneil et al. 1999). Research has shown that such exposure to trauma often leads to poorer family functioning, including increased irritability, fighting, withdrawal, and decreased enjoyment of shared activities (McFarlane 1987).

From a developmental perspective, it is plausible to suggest that children of FRs will be more likely to manifest an early-onset of mental health problems than would be expected for children whose parents are seldom, if ever, exposed to violence or danger in their work. Children of FRs whose parents report impaired parenting will be most vulnerable. Due to cumulative experiences and increased understanding about the hazards involved in their parents' work, mental health problems in children of FRs will increase with age.

Can Israeli Families Help Us to Understand the Impact of Familial Exposure to Violence on Children?

Studying Israeli First Responders and their children can provide much needed insight into this particular population characterized by a situation of ongoing conflict and mass violence.

The Israeli population, which frequently experiences terror attacks, rocket fire, scud missiles, and suicide bombings, can offer information drawn from a population which experiences repeated exposure to mass violence. This population stands in sharp contrast to that in the New York City sample, which has been subjected to terror attacks on rare occasions. Certainly, Israel has had a long

history of involvement with conflict, wars, terrorist attacks and other threats, as well as the fact that a sizable portion of the Israeli population are either Holocaust survivors or the progeny of survivors (Solomon 1996). Schwartz et al. (1994) studied families of Holocaust survivors to investigate possible nongenetic familial transmission of trauma and psychiatric disorder. While this study found no elevated rates of current psychiatric disorder in children of survivors as compared to controls, it did find a higher lifetime prevalence of psychiatric disorder in this population. A group of Holocaust survivors who were at the time not known to be symptomatic of retraumatization experienced reactivation or exacerbation of the survivor syndrome after their homes were damaged during the SCUD missile attacks in the Persian Gulf War. Nearly half of this group presented full criteria of PTSD (Robinson et al. 1994). Among Israeli bus commuters, coping strategies were found to be associated with anxiety related to terrorism (Gidron et al. 1999). Among 15 noninjured Israeli women who had been the target of a terrorist attack, there was an association between the appearance of phobic anxiety immediately following the event and later distress, with six of the women (27%) receiving a full diagnosis of PTSD 6 months after the event (Amir et al. 1998). In a study conducted 17 years after a terrorist seizure of 100 hostages, a very intense—as opposed to moderate or minimal—sense of victimization impacted on long-term adjustment (Desivilya et al. 1996). Another relevant issue is the frequently observed reactivation of combat-related PTSD, which in Israel, where military service is mandatory, would lead to greater PTSD vulnerability.

Information regarding Israeli children's mental health as impacted by repeated exposure to mass-violence is scarce (Pat-Horenczyk et al. 2007; Solomon and Lavi 2005). A study conducted on Israeli children, 10 years after their parents' deaths resulting from terrorist activity, indicated that the children's adjustment may be affected by further terrorist activity, war, or from being required to be involved in Israeli military duty, any of which may trigger and/or exacerbate post-traumatic symptoms (Dreman 1989; Dreman and Cohen 1990). Two cross-sectional studies examining middle- and high-school students as to the effects of exposure to SCUD missile attacks during the Persian Gulf War not surprisingly revealed that fifth-grade females who lived in regions that were hit by SCUD missiles reported higher stress than fifth-grade females in regions that were not hit (Schwarzwald et al. 1993); and that sixth-graders had notably stressful long-term reactions (Weisenberg et al. 1994). Another study of Israeli school age children evacuated from homes during massive missile attacks, documented that 6.3% children met all three PTSD criteria, and 51.2% met at least some of the PTSD-related criteria (Klingman 2001).

Of interest in the context of repeated exposure to violent events is a study done by Ng-Mak et al. (2004) that looked at New York inner city youth exposed to frequent community violence. The results shed light on the phenomenon of pathological adaptation where these youth displayed more externalizing aggressive behaviors, and showed psychological desensitization to violence and fewer internalizing symptoms (Ng-Mak et al. 2004). It might be interesting to study this effect via the Israeli sample since they too have repeated exposure to violent events and may or may not have the same type of response to it.

Knowledge about the principal factors and mechanisms involved in persons presenting mental health problems after violent events, particularly mass violence, is essential for designing of public health interventions. Israel has a long history in disaster preparedness which has been widely disseminated to the general population (Kelodi 2002; Yodfat 2003; Home Front Command 2005; Klingman 2000; Shalev 2002). Hence, a study of children of First Responders in Israel in the context of these policies, can inform other nations, like the United States, on preparing children for mass disasters.

Lessons from the WTC Attack: Children of First Responders and WTC Evacuees

The World Trade Center—Department Of Education study (WTC DOE) ($N = 8,236$) conducted on a representative sample of NYC public school students by the Child Psychiatric Epidemiology Group 6 months after the WTC attack. That study provided preliminary information indicating that children whose parents were highly exposed to the WTC attack (WTC evacuees and First Responders) had higher rates of mental health problems than those who were not (Hoven et al. 2005; Hoven et al. 2004; Wu et al. 2006). An analysis of NYC-BOE WTC sample, focused on probable PTSD in children of FRs (Duarte et al. 2006). As mentioned earlier, children with EMT family members had the highest rate (18.9%), followed by children who had police officers as family members (10.6%), who were very similar to children without any FR (10.2%), while children with fire fighters as family members had the lowest prevalence of probable PTSD (5.6%). Rates of other probable disorders can be found in Table 1. While demographic differences can explain some of the differences observed between EMTs and fire fighters, other factors might also be important. A more in-depth examination of career selection, pre-employment psychological status, recruitment, training characteristics, and work group support may help to explain the study's findings. A hypothesis that deserves further study is that children's appraisal of parental occupation might play an important role in children's psychological responses.

The WTC DOE Study provided preliminary information indicating that children whose parents were highly exposed to the WTC attack (WTC evacuees or First Responders) had higher rates of mental health problems than those whose parents were not highly exposed (Hoven et al. 2005; Hoven et al. 2004; Wu et al. 2006). Figure 3 shows the impact of having a parent or family member who died or was an evacuee on children's psychopathology, especially probable PTSD and major depression, separately for children who had direct exposure to the WTC attack and those not exposed to the WTC attack. The results indicate that a child's direct exposure to the attack, and a family member's exposure to the WTC attack, each independently contribute to an increased risk for developing probable PTSD or major depression. Among those children who were not exposed to the WTC attack, the lowest rate of probable PTSD was found among those who did not have family members who were in the WTC during the attack (6.8%); the highest rate of probable PTSD was found among children whose family members had died during the WTC attack (17.6%). Relatively higher rates of PTSD were found among those with direct exposure to the WTC attack, given the same type of family member exposure status. Therefore, the highest rate of PTSD was found among those children who was direct exposed to the WTC attack and had a family member die during the attack (36.4%). A weaker but similar relationship was found for probable major depression.

Figure 4 presents data regarding the relationship, among children, between one's having particular types of First Responders (police officers, EMTs and fire fighters) in one's family, and probable PTSD and major depression, controlling for the child's own exposure to the WTC attack. Among children without exposure to the WTC attack, those with EMTs as family members had the highest rate of probable PTSD (15.1%), followed by those with police officers as family members (8.1%), who were very similar to children not having any family member being First Responders (7.5%), while children with fire fighters as family members who had the lowest prevalence of probable PTSD (2.9%). The distribution for children with direct exposure to the WTC attack has a similar pattern. For probable major depression, those with family member EMTs also had the highest rates compared to other groups. But the rates of probable major depression for those in families with fire fighters were not lower than those families with police officers and those families without First Responders.

These results highlight the importance of better understanding mechanisms underpinning the impact of parents' exposure to a disaster on children's mental health. It suggests a different impact on child mental health as related to specific First Responder jobs held by the parent. It may be

Table 1 Expected frequency of disorders and exposures among populations highly exposed to violent events

	Police officer	Fire fighter	EMT	WTC evacuee	Non-WTC evacuee
<i>Frequency of psychiatric disorders after the WTC attack</i>					
Probable PTSD (%)					
Parents	7.2 ^c	14.3 ^c	14.1 ^c	17.9 ^c	5.5 ^c
Child	10.6 ^a	5.6 ^a	18.9 ^a	19.5 ^b	10.2 ^b
Probable MDD (%)					
Child	8.4 ^b	9.1 ^b	11.1 ^b	11.3 ^b	7.9 ^b
Any probable emotional Dx (%)					
Child	31.4 ^b	28 ^b	43.5 ^b	38.7 ^b	28.2 ^b
<i>Frequency of exposures</i>					
Direct exposure					
Adult/parents	61.4 ^c	67.8 ^c	47.3 ^c	93.1 ^c	37.4 ^d
Child	29.5 ^a	30.6 ^a	30.0 ^a	41.2 ^b	23.9 ^b
Work related events					
Parents	—	42 ^g	55.8 ^f	—	—
Child	—	—	—	—	—
Traumatic life events					
Parents	—	—	—	29 ^c	30.5 ^c
Child	32.6 ^a	31.2 ^a	42.2 ^a	24.0 ^b	30.8 ^b

^a WTC DOE Study: Duarte et al. (2006) (based on a screening instrument—DPS)

^b WTC DOE Study: unpublished analysis (based on a screening instrument—DPS)

^c Evacuee Pilot Study ($N = 30$ evacuees) (based on a diagnostic instrument—CIDI). Estimate of traumatic life events is based on having two or more traumatic events before 9/11 according to the manual developed by Saltzman et al. (1999)

^d Galea et al. (2002)

^e Perrin et al. (2007)—based on the exposure “witnessed trauma”

^f Near death experiences for paramedics (Regehr et al. 2002)

^g On-duty “serious injury” (U.S. sample) (Beaton et al. 1999)

Fig. 3 Prevalences (weighted) of probable PTSD and MDD, among NYC public school students in grades 4–12, whose family members were (or were not) in the WTC at the time of the attacks ($N = 8,236$)

that a child's appraisal of his or her parent's First Responder occupation plays an important role in shaping the child's psychological responses. This hypothesis merits further research.

As an attempt to advance our understanding, we compared frequency of child psychiatric disorders with exposure to all traumatic events (WTC attack, work-related events, and non-WTC related life events) on populations of

Fig. 4 Prevalences (weighted) of probable PTSD and MDD, post-WTC attack among NYC Public School students in grades 4–12, with and without First Responders in the home (Children who had EMTs only, police officers only and fire fighters only living at home are included. Data are not shown for children who had two or more First Responders living at home ($N = 237$))

parents who were highly exposed to the WTC attack, namely, First Responders and WTC evacuees and their children (see Table 1) based on results from the WTC-DOE study, as well as other data that our group has collected and information cited in the literature. A column with information about non-WTC evacuees was also included, providing a backdrop against which to understand observed rates among WTC evacuees.

A close examination of the available information from the WTC DOE Study indicates that there was considerable variation in the children's likelihood of screening positive for a psychiatric disorder after the WTC attack. Here, diagnostic information, particularly based on parent and child reports, would have been key to determine the consistency of the patterns observed. In addition, Table 1 clearly shows that key pieces of the puzzle were missing, such as knowledge about other, non-work related exposures experienced by First Responders who are parents, as well as the extent to which children are aware of, and therefore also to some extent exposed to, their parents work-related traumatic experiences. Most importantly, only very partial information was available on the combined experience of parents and children. It was within this context that the "Children of WTC Evacuees and First Responders Study" was proposed.

The Children of First Responders and WTC Evacuees Study

The main goal of the study, "Children of First Responders and WTC Evacuees," funded by the National Institute of Child Health and Human Development, is to understand the impact over time of parental exposure to stress and traumatic events on their children, including protective as well as risk effects. Children of First Responders (police

officers, EMTs and fire fighters) will be compared among themselves. In addition, children whose parents were directly exposed to an isolated mass-violent event (WTC) will be compared to community controls. This is a two-site longitudinal study, to take place in the United States (New York City) and Israel (Tel Aviv area). In trying to understand the impact of different types of mass violence, NYC allows for better examination of the impact of an isolated mass violent event (i.e., the WTC attack), while Israel provides unique information about repeated exposure to mass violence. The inclusion of both sites, therefore, allows us to consider a broad range of situations.

Methods

To thoroughly assess the effects of parental exposure to mass violence on children this study recruited First Responders (fire fighters, police officers, and EMTs) from the New York City area that were involved in the rescue and recovery efforts for the WTC attacks that occurred on September 11, 2001, since this group can provide insight into the effects of a single exposure to mass violence. Additionally, First Responder participants were recruited from the Tel Aviv area of Israel as well, since these participants have the potential to provide insights on the effects of constitutive exposure to acts of mass violence.

Specific Participant Sampling and Recruitment Strategies are in Place in the NYC and Tel Aviv Sites

In NYC, the World Trade Center Health Registry (WTCHR) has been a valuable source of information about First Responders as well as other WTC evacuees, since over 71,000 individuals enrolled in 2003–2004, when the Registry was created as a joint effort between the New York City Department of Health and Mental Hygiene and

the U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry. The WTCHR is currently the largest effort in the United States to monitor the health outcomes associated with a mass disaster. The registry was created with the goals of documenting and evaluating the long-term health effects of the WTC disaster by conducting periodic surveys. Baseline surveys were conducted in 2003–2004 and 2006–2007. These assessments included questions about physical and mental health of the enrollees as well as questions pertaining to levels of exposure to dust smoke and debris.

More than 90% of registrants have reported an interest in participating in other studies related to the WTC disaster, and thus provide a highly useful source of recruitment for potential study participants. The Children of First Responders and WTC Evacuees Study has been granted access to these registrant listings. Recruitment of the WTC Health registrants into our study is described below. In addition to access to the registrants, the WTCHR's collected survey data pertaining to participants of our study that can also be made available to us, with participants' permission. These data will considerably improve our capacity to assess the effects of parental exposure to the WTC attack on children's mental health (e.g., parental exposure to the WTC attack), because they were obtained at a point in time closer to September 11, 2001, and are therefore probably a more reliable indicators about objective parental exposure than those we will now be able to obtain.

Both in New York City and in Israel, eligibility criteria to participate in the study include the presence of a First Responder or WTC evacuee in the family as a parent/caretaker having a child within ages 9–16 living in the household. If there should be more than one child in the eligible age range, a Kish table is used to randomly determine the target child. The First Responder or evacuee families include an Index child age 9–16, a First Responder parent and (if present) the spouse of the First Responder. The control group target families are selected based on the presence of a resident child ages 9–16 and will include a matched Control Child as well as the parents of that Control Child. The New York City sample will comprise $N = 900$ families, with a total of $N = 2,700$ individual family members, the Israeli sample will comprise $N = 350$ families, with $N = 1,050$ individuals (see Table 2).

New York City Sample

First Responders and WTC Evacuees

As mentioned before, in NYC, WTC involved First Responders and WTC evacuees are identified by the WTCHR. A method was developed to select random

Table 2 Children of First Responders and WTC evacuees: Study sample

New York City sample		
Study families		
1. Police officers		
2. Emergency medical technicians		
3. Fire fighters		
4. Other First Responders		
5. Families of WTC evacuees		
6. Community controls		
Family member to be interviewed		
1. Target families		First Responder or WTC evacuee
		Index child
		Spouse
2. Control families		Mother
		Father
		Control child
Israeli sample		
Study families		
1. Police officers		
2. Emergency medical technicians		
3. Fire fighters		
4. Control group:		Families of Tel Aviv school children
Family member to be interviewed		
1. Target families		First Responder
		Index child
		Spouse of First Responder
2. Control families		Mother
		Father
		Control child

samples for each one of the study groups based on information from the WTCHR registrant's First Responder and/or WTC evacuee group membership, including presence of a child in the household and zip code of residence (<100 miles from NYC). The recruitment process starts with the WTCHR mailing and emailing an introductory package introducing the study to the randomly selected First Responder and evacuee families in batches of 1,000–2,000, inviting eligible families to participate, where eligibility is defined as having a child between the ages of 9 and 16 years of age. Mailings are subdivided among fire fighters, police officers, EMTs, and WTC evacuees. To improve the response rate, each potential participant receives up to three mailings and emails.

Included in the introductory package is an information sheet and consent-to-contact form from our research group

for eligible participants. If the family agrees to be contacted, they mail a consent to be contacted back to our office. The family also receives the study office telephone number, should they wish to contact us directly with questions or to enroll. After contact consent is received, parents are contacted by telephone to further explain the study, ascertain their eligibility and to determine if they are willing to participate in the study.

Control Group

The control sample ($N = 180$) consists of non-WTC evacuees who are matched with the WTC evacuees ($N = 180$). Child community controls matched by age and gender to a WTC evacuee living in the same geographic area are recruited via targeted enumeration, in which the InfoUSA database will be utilized to target enumeration efforts only to households that are potentially eligible. The InfoUSA database catalogues publicly available information for over 200 million US households, such as phone number, address, and whether or not children reside in the house. Utilizing the database, 25–30 households in a given area that could potentially meet the requirements of our study are identified and targeted for enumeration. The addresses and phone numbers of potentially eligible households are requested from InfoUSA and the contact information is used to send an informational ward-off letter to each household. If the household does not express their disinterest in participating, a follow-up phone call is made to discuss the possibility of recruitment into the study. All potentially eligible families are contacted until a participating family is identified.

Israeli Sample

Index Sample

Recruitment of Israeli participants follow a procedure similar to that used to obtain First Responder recruits in New York, and is carried out by Tel Aviv University. The difference in the recruitment procedure is that project staff at Tel Aviv University work with the Directors of First Responder groups as a point of contact with potential recruits. These points of contact include the Head of the Fire-Fighters National Authority, the Chief Medical Officer of the Israel Magen-David, and the Chief Science Officer and the Chief Medical Officers of the Israel National Police Force.

Control Sample

The control sample is recruited from Tel Aviv schools ($N = 140$ children ages 9–16), whereby Tel Aviv

University randomly selects schools to conduct the study. After the schools are selected, the research team randomly selects the classrooms and sends an introductory letter and a consent-to-contact form to all parents in the classes, requesting their consent to participate in the study. Israel also utilizes snow-ball methods to recruit their control sample into the study.

Interview Procedures

After a household is identified, consent-to-contact is obtained, and participants agree to be interviewed, a computerized baseline interview is scheduled with members of the target and control families, with follow-up interviews conducted 12 months after the first interview.

All interviews are conducted in person and individually, with both parents and the selected child. The interview procedure is identical for the New York and Israeli sites, with New York interviews being conducted by Columbia University research staff and Israeli interviews being conducted by Tel Aviv University project staff and the Public Opinion & Marketing Research of Israel, Ltd (PORI) organization.

Measures

Interview questions seek to assess the mental health status of participants, as well as factors such as parental exposure to stress and violence (work- and nonwork related), and the type(s) of exposure the individual had to the WTC disaster. Questions are also asked to assess the relationship between the parent and child, the types of social support available to the family, and the child's familiarity with disaster preparedness. The specific measures asked as a part of our interview process are summarized in Table 3. All instruments have been translated and adapted to Hebrew in Israel. The Israeli translation and back translation was done at Tel Aviv University with PORI organization.

The study design collects the same information in both NYC and Israel. Study hypotheses will be examined independently in each site, by comparing First Responder groups among themselves and/or with controls, at the same site, as well as WTC evacuees with controls in NYC. By applying this strategy, we avoid the risk of drawing invalid conclusions that disregard differences in type of exposure and cultural experiences between the two national contexts.

Findings from multiple samples where children and parents are exposed to different types of violence and have received different levels of disaster preparedness education will not only be more reliable but also applicable to a wide range of situations.

Table 3 Summary of the measures used in the study

	Child		Parent	
	Description	Measure	Description	Measure
Mental health	Structured diagnostic interview that measures six psychiatric disorders including PTSD and child smoking behavior	Diagnostic Interview Schedule for Children, Version IV—DISC-IV (Shaffer et al. 2000) DISC Predictive Scales (DPS) (Lucas et al. 2001) Child tobacco use adapted from questions from the National Survey for Parents and Youth from NIDA	PTSD, Depression alcohol and substance use	Composite International Diagnostic Interview—CIDI (Wittchen 1994) PTSD checklist (PCL) (Weathers et al. 1993) Beck Depression Inventory II (BDI) (Beck et al. 1996) K-10 (Kessler et al. 2002)
Exposure to potentially traumatic events ^a				
Work-related	Children's knowledge about multiple dimensions of critical incident operations	Critical incident history questionnaire adapted (CIHQ)—Child Version	Multiple dimensions of critical incident operations	CIHQ (Marmar et al. 1996)
Mass violence	Personal physical exposure to the attack on 9/11	WTC-BOE-Survey Questionnaire—Child Version (Hoven et al. 2002b)	Exposure to WTC and other terrorist acts	WTC-BOE-Survey Questionnaire—Child Version (Hoven et al. 2002b)
Individual	Stressful or traumatic life events experienced by a child	Life events scale (Tiet et al. 2001)	Stressful or traumatic life events experienced by a child	Stressful life events (Gray et al. 2004)

Note: Other risk/protective factors being measured: *Child:* Demographics, Intelligence, Personality, family environment, Parenting, Social Support, Appraisal of Parental Exposure, Disaster Preparedness, Prior trauma, Family and Media Exposure, Health effects, School performance, Service need and utilization, Coping strategies, Loss and bereavement, Stigma, and prejudice, Perspectives on the future. *Adult:* Demographics, Personality, Family Environment, Prior trauma, Family and Media Exposure, Health effects, Service need and utilization, Coping strategies, Loss and bereavement, Discrimination, Stigma, and prejudice, Perspectives on the future

^a Includes violent and nonviolent events

Study Implications: Disaster Preparedness and Child Mental Health

Besides the implications of the WTC Evacuee and First Responder Study for understanding the impact of parental exposure to mass violence on child mental health, our study also aims to inform strategies to respond to mass violent events in particular, and possibly mass disaster events in general, at a population level, with particular focus on children.

Activities aimed at preparing civilian populations (adults or children) for mass traumatic events are usually titled “disaster preparedness” and are designed to have a protective impact on reactions to mass traumatic events, including, but not limited to terrorist attacks.

Regarding the effect of such programs on children, we are aware of only one study, conducted in Australia, which reports that those involved in hazard education programs expressed more stable risk perception and awareness about protective behaviors than children who did not participate in such programs (Ronan et al. 2001).

Even in Israel, there are no empirical studies of the impact of the implementation of disaster preparedness procedures on children. Indirect information can be derived from the study of a representative sample of adult Israelis, which found that 74.6% of the responders expressed self-efficacy with regard to their ability to function in a terrorist attack while at the same time 60.4% expressed a low sense of safety regarding themselves and their relatives (67.9%) (Bleich et al. 2003).

Programs on emergency preparedness for children and families have begun to emerge since September 11 in NYC (New York City Office of Emergency Management 2003). In the school system, New York City Department of Education school officials report that they are trained about terrorist threats and they perform regular fire drills (Phinney 2004); however, it is not clear which instructions children receive. Assessing whether disaster preparedness strategies help to enhance children’s sense of safety and/or mental health outcomes would be of great value for guiding these initiatives in NYC, and possibly around the country.

Disaster Preparedness in Israel

Israel has a long history and extensive guidelines about disaster preparedness, disseminated by the Ministries of Education and Health, Municipalities, and by the Home Front Command, providing guidelines to specific groups, from kindergarten level to high school, civilian work places, senior citizens, etc. (Kelodi 2002; Yodfat 2003; Home Front Command 2005; Klingman 2000; Shalev 2002). For instance, in kindergartens, there are instructions about how to distribute responsibilities, collaborate with parents and

community agents, provide first aid, make security rooms and shelters child friendly, and how to carry on routine activities.

The new information derived from the Israel site of our study can be expected to inform the discussion of how the USA should best prepare children for the event of mass violence and possibly also in the event of repeated exposure of their parents to violent acts.

Measuring Disaster Preparedness

Questions probing children’s knowledge about disaster preparedness strategies to be used in emergency situations are being asked about the home and school environments. More specifically, we ask if: (a) children know how to get out of their homes in an emergency; (b) they had a practice drill to evacuate from both home and school and if these drills involved leaving the building; (c) their reactions to these drills (did they feel more reassured or more anxious); (d) their families have a plan for how to find each other if there is an emergency; (e) there is a “safe room” in their house where the family can take shelter in an emergency (safe rooms are virtually universal in Israel). These questions cover a broad spectrum of possible strategies, relevant to the NYC and Israeli contexts. In addition, information about children’s sense of safety and sense of parents’ preparedness is collected.

Conclusion

Exposure to acts of violence and other traumatic events may vary according to the nature (e.g., violent or nonviolent) and scope (mass or individual event) of the event, in conjunction with endogenous and contextual characteristics of the individuals exposed, including their social and familial context. In mass-violent events, particularly ones classified as acts of terrorism, exposure to violence transcends the directly exposed individuals and may possibly include those who are merely proximally affected. The exposure may include an entire population, and often indirectly impacts exposed and even unexposed families. In formulating improved post-mass disaster public health interventions, it is essential to develop a better understanding of the principal factors and mechanisms involved in the etiology of illness of all those who show evidence of mental health problems after such events, particularly the violent ones as they are more likely to leave more intense sequelae.

Since September 11, 2001, attention has focused on the tragic events witnessed by WTC evacuees, New York City Fire Fighters, Police Officers and Emergency Service personnel at the WTC. Although they too have suffered

greatly, less attention has been paid to stresses endured by the children of WTC evacuees and First Responders. There is preliminary evidence suggesting that these children have experienced significant mental suffering related to their parents' exposure, possibly coupled with their perceptions and fears of ongoing threats of future mass violence and terrorism. A comprehensive study of factors involved in mediating children's reactions to their parent's exposure provides an opportunity to expand upon our prior knowledge and understanding of relevant links between children's mental health and their parents' exposure to mass violence, experienced or not, in the context of parents' work lives.

Concentrating on children of First Responders living in two very different parts of the world (New York City and Israel), who experience different levels and different frequencies of mass-violence, will permitted us to contrast their behavioral changes, and consequently to improve the understanding of the different factors that influence the psychological reactions of these differently exposed children. The inclusion of both the New York and Tel Aviv sites allows us to examine the impact of parental exposure to mass violence, ranging from isolated (New York) to repeated (Tel Aviv) exposures, making the results of this investigation applicable to a wide range of circumstances. The Israeli sample will allow us to examine the effects of First Responders' chronic exposure to terrorist threats and its effect on their children, as well as the possible protective effect of well-developed disaster preparedness strategies.

The inclusion of WTC evacuees and their children further permits us to examine mental health development in two generations of a population that has experienced a major, shared, one-time traumatic event. In the case of NYC First Responders, an improved understanding of the mechanism of familial transmission of mass violence-related mental health problems may inform important policies that can lessen the psychological burden on these occupational groups and their children, even as their job functioning may be improved. This improved understanding cannot only reduce untoward psychological effects, but also reinforce national response capabilities.

As noted, this investigation includes a standardized evaluation of a population of children and their parents never previously studied in a systematic, longitudinal manner. Comprehensive assessment of child mental health reactions after violent mass-disasters, including terrorist attacks, is the core of our study design. Collaboration with Israeli investigators and the analysis of the impact of disaster preparedness strategies currently in place for Israeli children has the potential to improve United States preparedness after mass-violent attacks. In spite of the benefits of this bi-national investigation, cross-cultural comparisons are limited due to uncontrollable differences between the two sites. Furthermore, assessment of parental

transmission of trauma would be more informative if genetic and biological factors could be considered alongside biopsychosocial factors.

Given the continuing threat of mass violence worldwide, it is more important than ever to understand how to identify and help children who may become vulnerable to mental health problems as a result of an exposure to such violence. Therefore, we anticipate that this study will: (1) Help identify the needs of a vulnerable child population that has previously received little attention; (2) help to improve services to children and families who have experienced parental work-related violence, particularly mass violence or terrorism; (3) contribute to an understanding of the effects of work-related violence and stress on families and children, over time, and; (4) increase understanding of the familial transmission of trauma, resulting from mass violence, from parents to child.

In light of the continued menace of terrorism, we believe that the First Responders and WTC evacuees participating in this study are in a key position to provide the scientific community with insights into how mass violence traumatic events may extend well beyond those directly exposed.

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