Parental Occupational Exposure is Associated With Their Children's Psychopathology

A Study of Families of Israeli First Responders

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Objective: To examine the association between parental occupational exposure to traumatic events and their children's mental health in families of First Responders (FRs), a neglected area of research. **Methods:** In 208 families of Israeli FRs, children's symptoms and comorbidity patterns of seven psychiatric disorders were regressed on parental work-related variables, controlling for relevant covariates. **Results:** Having a father working as a FR and higher paternal exposure were associated with a greater number of separation anxiety and posttraumatic stress symptoms, respectively. Maternal exposure was associated with a greater number of symptoms of generalized anxiety, panic disorder, depression, and oppositional defiant disorder, and with increased odds of comorbid internalizing symptomatology. **Conclusions:** Additional research on children of FRs is encouraged. An adaption to this understudied population of family-centered interventions available for military families could inform targeted prevention efforts.

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Clinical significance: In families of First Responders (FRs), higher parental occupational exposure to traumatic events was associated with their children psychopathology, controlling for relevant covariates. Additional research in children of FRs will be needed to adapt promising family-centered interventions developed for military families to this understudied population and inform targeted preventive efforts.

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Learning Objectives

- Become familiar with the Children of First Responders study, which examines the relationship between parents' occupational exposure to trauma and their offspring's mental health.
- Summarize the new findings on associations between parental exposure to trauma as a first responder and symptoms of specific psychiatric disorders in children.
- Discuss the implications for family-centered interventions to prevent adverse effects of secondary traumatization in this understudied population.

Keywords: children, first responders, indirect exposure, occupational exposure, psychiatric disorders, psychopathology, secondary traumatization

> ''*Indeed, simply being a member of a family and caring deeply about its members makes us emotionally vulnerable to the catastrophes which impact them. We, too, become ''victims'', because of our emotional connection with the victimized family member*'' (Figley, 1983, p. 12).

The psychologist Charles R. Figley, a Vietnam War veteran, introduced the concept of ''secondary traumatic stress'' to describe the empathy-induced emotional upset resulting from learning about traumatic events experienced by a loved one, which was often observed in people caring for family members returning from Vietnam.[1] In DSM-V,[2] learning about a traumatic event that occurred to a close family member or close friend is now part of Criterion A as a qualifying traumatic exposure for posttraumatic stress disorder (PTSD). Figley showed that unresolved secondary traumatic stress could, in part, explain the manifestation of trauma-related psychiatric symptoms in unexposed individuals; his work led to an interest in the study of mental health among trauma-exposed parents and their un-traumatized offspring.[3]

There is now a vast literature on the relationship between parental trauma-related psychopathology and children's mental health.[4] Many studies using independent samples have examined psychopathology in unexposed offspring of parents who developed PTSD in response to a specific event, such as the Holocaust or combat. Those studies indicate multifinality in regard to developmental psychopathology, in that elevated parental PTSD is associated with a range of adverse outcomes in their unexposed offspring, including high rates PTSD symptomatology, major depression, and impaired HPA-axis functioning.[4]

A recent review of the literature suggests several mechanisms to explain the association between parental PTSD and their

children's mental health.[4] A crucial mediator may be parenting, which is negatively impacted by the affective, behavioral, and cognitive disturbances experienced by parents affected by PTSD.[4] Elevated parental PTSD symptoms have been associated with reduced parenting satisfaction and lower quality of parent–child relationships. Adverse parenting practices (eg, over-reactive disciplinary tactics, elevated angry outbursts, and violence) may also increase vulnerability to psychological maladjustment among children of parents with PTSD. Finally, children of parents with PTSD may experience less parental engagement and affective involvement and more emotional neglect from their parents.[4] Exposure to environmental stressors could be another key pathway by which offspring are negatively impacted by parental PTSD; for example, exposure to stressful life events, such as chronic stress due to family relations, is elevated among offspring of mothers with PTSD.[4]

An important limitation of the literature summarized above is that most studies focus on families of war veterans and active military members, and on offspring of Holocaust survivors.[4] Furthermore, these studies did not examine how parental exposure affects offspring mental health independently of parental psychopathology. First Responders (FRs), including police officers, firefighters, and emergency medical technicians (EMTs), are a particularly neglected population in the study of secondary traumatization, despite the fact that in their daily work they are routinely and repeatedly involved in high-stress, life-threatening situations, which puts them at elevated risk for becoming traumatized.[5–7] Individuals who work in high-risk occupations, such as FRs, are also at heightened risk for serious mental health problems, including PTSD, anxiety, depression, substance use, and suicidality.[5,8–13]

Importantly, parental occupational exposure to violent, dangerous, or distressing events may also put their indirectly exposed children at risk for mental health problems, independently of parental psychopathology.[6] For example, children in close contact with traumatized FRs may develop PTSD symptoms through secondary traumatization.[14] To date, research on children of FRs is very limited. A study in a representative sample of NYC public school students assessed six months after the 9/11 World Trade Center (WTC) attack revealed that the highest rate of probable PTSD (18.9%) occurred in children with EMT family members. The rate of PTSD among children with police officer family members (10.6%) was similar to that observed among children with no FR (10.1%), whereas children with firefighter family members had the lowest prevalence of probable PTSD (5.6%). Further analysis suggested that the high rate of PTSD observed in children with EMT family members is explained by a combination of their exposure to the WTC attack and sociodemographic characteristics.[14] In children of police officers and non-traditional FRs (eg, construction workers) who responded to the WTC attack, Uchida et al[15] examined the correlates of parental report of 12 child behavioral problems, divided into three groups of fearful/clingy behavior, externalizing behavior, or somatic problems. Higher parental WTC exposure severity (such as 'participated in search and rescue'; 'caught in the dust cloud'; 'death of a colleague, friend, or family member on 9/11') was associated with elevated behavioral problems in children of police officers, and with higher rates of fearful/clingy behaviors in children of police officers and non-traditional FRs. Among children with relatives who took part in the manhunt following the Boston Marathon bombing attack of April 2013, the prevalence of parental report of children's PTSD was 5.7 times higher, compared to children without relatives who participated in the manhunt. Controlling for child demographics and for children's exposure to the initial Marathon blast and to other manhunt events (eg, hearing or seeing manhunt-related gunshots or explosions; officers entering or searching their home), having a relative in the manhunt showed a unique and significant association with elevated child PTSD symptoms, and with emotional symptoms and hyperactivity/inattention from the Strengths and Difficulties Questionnaire. The relationship between these outcomes and having a relative who participated in the manhunt was mediated by fear that the relative could be hurt during the manhunt.[13]

Studies with children of deployed military personnel are confounded by the impact of prolonged family separation,[16–18] while previous investigations of children of FRs have five main limitations. First, children's outcomes were examined in relation to parental involvement with a specific event, such as the WTC attack[15] or the Boston marathon bombing.[13] Second, previous studies have focused only on one psychiatric disorder (PTSD),[13,14] or have employed brief behavioral screening questionnaires.[13,15] Third, no prior study examined whether parental exposure is associated with different patterns of comorbidity among psychiatric disorders in their offspring. This is a significant limitation, given the extensive degree of comorbidity among psychiatric disorders in childhood and adolescence.[19–21] Fourth, children's outcomes were assessed only through parent's reports[13,15] or children's self-report.[14] Finally, analyses of the relationship between parental variables and children's outcomes either did not control for potential mediators and covariates,[15] or controlled only for children's exposure to the WTC attack[14] or to the blast and manhunt exposure in Boston,[13] without adjusting for parental psychopathology and other key family factors (eg, parent-child relationship, parenting behaviors) that may directly impact the offspring's functioning and at the same time partially explain the relationship between parental occupational exposure and offspring outcomes.[4]

Consequently, to date, research on children of FRs has not thoroughly examined their risk of psychiatric outcomes. Such research is warranted given the recognized need to understand the clinical needs of youth with relatives in high-risk occupations, characterized by cumulative exposure to work-related traumatic events.[6,13] To our knowledge, the Children of First Responders Study,[6] funded by The Eunice Kennedy Shriver National Institute of Child Health and Human Development, is the only study specifically designed to examine—in families of FRs—the relationship between parental exposure to trauma and their children's psychopathology (secondary traumatic stress), taking into account a broad array of potential mediators, such as parental psychopathology, the youth's own exposure and the family environment (monitoring/attachment, family satisfaction and parent-child relationship). The Children of First Responders Study was conducted (2006 to 2013) in New York City (NYC) and in Israel. The study aimed to understand the impact of parental exposure to mass violence and work-related traumatic events on their children.[6] Recent findings in the NYC sample showed high rates of parental exposure to work-related traumatic events, measured with the Critical Incident History Questionnaire—CIHQ.[5] FRs reported an average exposure to more than 18 distinct types of critical incidents, with a range of 2 to 32. Since in many cases exposure to a specific kind of critical incident happened more than once, the overall frequency of exposure to critical incidents was 205, with a range of 3 to 820.

In the Israeli sample of the Children of First Responders Study, we addressed some of these gaps in the literature by examining, for the first time, the relationship between psychiatric outcomes in children of FRs and their parents' exposure to work-related traumatic events (quantified with CIHQ Variety index). Importantly, the Israeli population frequently experiences terror attacks, rocket fire, scud missiles, and suicide bombings. Therefore, the Israeli sample can also offer information about children of FRs who experience repeated occupational exposure to mass violence, which is important because there is scarce information regarding children's mental health being impacted by living in a context where mass-violence is routine.[6,22,23] The aim of the study was to examine whether a child's symptom count of seven psychiatric disorders (plus their comorbidity patterns) is associated

with parental work-related factors (paternal FR status, paternal and maternal cumulative exposure to work-related traumatic events) independently of parental psychopathology, youth's own exposure to different types of life events, and the family environment (monitoring/attachment, family satisfaction and parent-child relationship). Given society's reliance on FRs, it should be a public health priority to understand how their occupation and occupational exposure may impact their children.[6,13–15]

METHODS

Participants

The data described here were drawn from the Israeli FRs Study,[6] a two-site study of families of FRs and controls conducted simultaneously in NYC (New York State Psychiatric Institute–Columbia University Medical Center) and in Israel (Tel Aviv University). A total of 215 families (parents, including a FR, and a child aged 9 to 16) were recruited in the central regions of Israel, including Jerusalem and Tel Aviv. If there more than one child in the family was of eligible age, a Kish table was used to randomly determine the target child.[6] Thus, the FR families included an index child age 9 to 16, a FR parent and (if present) the FR's spouse (occupation not-assessed). The control group families were selected based on the presence of an age matched child; each family included the child as well as her/his parents. Only three mothers reported currently working as a FR, but because of lack of power to detect any effect of maternal FR status on their children psychiatric outcomes, these families were excluded from the analysis. Thus, the focus of this study was on families of FR fathers, their non-FR spouses, and their children, and similarly constituted families of controls, in which neither parent was a FR. Four families had extensive missing data on the child outcomes and were also excluded from the analysis. The final Israeli sample included 208 families, including families of active-duty male FR—firefighters ($n = 72$), paramedics/EMTs ($n = 33$), and non-traditional FRs ($n = 3$)—and control families ($n = 100$).

Procedure

Recruitment of study participants was carried out by researchers from Tel Aviv University. Project staff collaborated with the Head of the Fire-Fighters National Authority and the Chief Medical Officer of the Israel Magen-David Organization (the Israeli Red-Cross) to facilitate recruitment of FR families. The human resource departments of the two organizations provided lists of personnel fitting eligibility criteria. Once the list was agreed upon, the two human resources departments sent each person on the list a letter signed by the Head of their organization explaining the purpose of the study, manner of recruitment and urging cooperation with the Tel Aviv University's research team. Thereafter, the research team approached via telephone the identified individuals. Those whose eligibility was confirmed (100%) asked for their personal participation and permission to include their child and the study. The control sample (families of parents who were not FRs) was recruited from the same communities or neighborhoods as the FR families. Each child of the FR group was asked to name one or two friends in her/his class or youth movement residing in the same neighborhood and to provide their phone numbers. A member of the research team then called their parents explaining the purpose of the study and requested permission to interview the child and the parents. Anonymity was guaranteed to all participants. Six control parents declined the request, and five control families dropped out during the data collection. After participants agreed to be interviewed, a computerized structured baseline interview was scheduled. All respondents, including the children, were interviewed privately, in person. Interviews were conducted by Tel Aviv University's project staff who were trained by the Field Director of the NYC site. This study was conducted in full compliance with the Institutional Review Board (IRB) of the New York State Psychiatric Institute–Columbia University Irving Medical Center (IRB number 4953, changed to number 6372 in 2012) and Tel Aviv University's Helsinki Ethics Committee (the Israeli IRB).

Measures

All measures were translated from English and adapted to Hebrew in Israel. The Israeli translation and back translation were done at Tel Aviv University with the Public Opinion & Marketing Research of Israel, Ltd (PORI) organization.[6]

Parental Work-Related Variables

Paternal FR Status

Paternal FR status was determined by the father's response to an item asking if he was currently working as a FR; a subsequent item asked for the primary FR occupation.

Paternal and Maternal Cumulative Exposure to Work-Related Traumatic Events

The frequency and severity of each parent's lifetime exposure to 41 work-related critical incidents was measured with an extended version of the Critical Incident History Questionnaire (CIHQ),[7] as in Geronazzo-Alman, Eisenberg, Shen, Duarte, Musa, Wicks, Fan, Doan, Guffanti, Bresnahan and Hoven.[5] Previous work showed that, compared to other CIHQ scoring methods, the 'Variety' CIHQ index (ie, the sum of the different types of incidents endorsed by the respondent, regardless of their frequency and severity) is a quicker and more efficient and clinically useful strategy to assess cumulative exposure in individuals routinely exposed to multiple work-related events.[5] Thus, the CIHQ Variety index (range: 0 to 41), computed separately for each parent, was used as an indicator of each parent's cumulative exposure to work-related traumatic events.

Parental Psychopathology

Each parent was assessed with three measures of psychopathology.

Maternal and Paternal Work-Related PTSD Symptoms

On a scale ranging from $1 =$ *not at all* to $5 =$ *extremely*, the PTSD checklist civilian version (PCL-C)[24] was used to measure the degree to which the participants were bothered by DSM-IV PTSD symptoms[25] in the most recent month. The total symptom severity score (range = 17 to 85), based on the sum of the scores from each of the 17 items, was used in the analyses.

Maternal and Paternal Major Depressive Disorder (MDD) Symptoms

MDD symptoms (sadness, pessimism, past failure, loss of pleasure, self-dislike, self-criticalness, and suicidal thoughts/wishes) experienced in the most recent 2-week period were assessed with the Beck Depression Inventory for Primary Care (BDI-PC).[26] Each symptom is rated on a 0 to 3 scale; the total symptom severity score (range 0 to 21), obtained by summing the ratings of each item, was used in the analyses.

Maternal and Paternal Psychological Distress

The 10-item Kessler Psychological Distress Scale (K10)[27] was administered as a global measure of distress; it contains questions about symptoms of anxiety and depression experienced in the most recent month. Scores range from 10 to 50. Scores under 20 are likely indicative of absence of a mental disorder, scores 20 to 24, 25 to 29, and above 30 are likely indicative of a mild, moderate and severe mental disorder, respectively; total score was used in the analyses.

Child's Direct Exposure

Children's exposure to stressful/traumatic events was assessed with three scales.

DSM-IV PTSD Criterion A Scale

The PTSD module of the NIMH Diagnostic Interview Schedule for Children (DISC) Version IV[28] includes a section for the assessment of lifetime exposure to six DSM-IV criterion A events: (1) being in a natural disaster where the respondent thought she/he was going to die/be seriously injured, (2) being in a situation when the respondent thought she/he was going to die or be seriously hurt, (3) being attacked/badly hurt, (4) sudden death of a loved one, (5) witnessing someone being killed/die suddenly (not on TV), (6) being in any other situation where the respondent thought she/he was going to be badly hurt/die or felt very afraid, helpless, or horrified. Exposure to any DISC PTSD criterion A event was used in the analysis.

Exposure to Other Traumatic Events

Six items from the UCLA Adolescent Trauma Exposure Survey[29,30] measured the following lifetime exposures: (1) being badly hurt in a violent/accidental situation, (2) seen anyone killed/badly injured, having a (3) close friend or a (4) family member killed/badly hurt in an accident/violent situation, (5) having lived in another country while there was a war going on, and (6) being in a big disaster. Exposure to any traumatic event was used in the analysis.

Positive and Negative Life Events

A modified 15-item Life Events Checklist (LEC) asked youth to report exposure to life events in the previous year (eg, going to a new school, moving, breaking up with boyfriend/girlfriend, or changes in parents' financial situation and, if so, to categorize the event as a "mostly good" or "mostly bad" experience.[31] Two separate variables were created: (1) exposure to any event ($\geq$1 event) rated as "mostly good" and (2) exposure to any event rated as "mostly bad".

Family Environment

Each child was asked to report on three aspects of the current family environment.

Monitoring/Attachment

On a scale from 1 = *never/almost never* to 4 = *very often*, youth were asked to report how often: (1) the parents know where the child is when she/he's away from home, (2) the child tells her/his parents about problems/troubles, (3) the parents talk with the child if they know something bothers her/him.[29,32] The items were reversed, and a total score$^{3-12}$ indicating negative monitoring/attachment was used in the analysis.

Family Satisfaction

On a scale from 1 = *almost always* to 3 = *hardly ever*, youth were asked to report how satisfied they were: (1) that they can turn to their families for help, and with the way their families (2) talk over things/share problems with them, (3) accept/support their wishes, (4) express affection and respond to their emotions, and (5) spend time with the child.[33,34] A total score$^{3-15}$ indicating negative family satisfaction was used in the analysis.

Parent–Child Relationship

On a scale from 1 = *no problems* to 3 = *lots of problems*, two questions asked youth to rate the relationship with their mother and the relationship with their father, respectively.[33,34] A total score$^{2-6}$ indicating negative parent-child relationship was used in the analysis.

Children's Outcomes

We examined two sets of psychiatric outcomes.

Psychiatric Disorders in the Previous Year

Symptoms of PTSD related to any traumatic event reported in the DISC DSM-IV PTSD criterion A scale, generalized anxiety disorder (GAD), separation anxiety disorder (SAD), agoraphobia (AGO), panic disorder (PD), major depressive disorder (MDD), oppositional defiant disorder (ODD), and conduct disorder (CD) were assessed with the DISC Predictive Scales (DPS),[35,36] a screening tool derived from the NIMH DISC Version IV.[28] Both the parents and the child were asked to report on the child's symptoms. Symptoms were considered present if reported either by the child or the parent/s. For each disorder, symptom count was used as the outcome.

Patterns of Comorbidity Among Psychiatric Disorders

Latent class analysis (LCA) examined the comorbidity among the 8 DPS disorders; LCA classifies children into groups with distinct probabilities of endorsing psychiatric outcomes. First, for each of the eight disorders, the number of symptoms endorsed was standardized; for each disorder, participants with a z-score $\geq$1 SD above the mean were considered positive (dichotomous outcome). LCA, performed with the R package *poLCA*,[37] was then applied to the 8 dichotomous outcomes. We started with a 2-class model and then increased the number of classes, with selection of the best fitting model based on the Bayesian information criterion (BIC) and Akaike information criterion (AIC); the 3-class model (Fig. 1) balanced the AIC and BIC values and was chosen as the final model (see also Text, Supplemental Digital Content 1, http://links.lww.com/JOM/A789, which explains in more detail why the 3-class model was chosen). Most youths were in the no-disturbance class (n = 152; 73.1%), which was defined by very low probability of symptom endorsement (see Table, Supplemental Digital Content 2, http://links.lww.com/JOM/A790, which shows, in addition to the descriptive statistics of each class, the mean number of symptoms of each disorder and of impairment indicators and the prevalence of dichotomous outcomes in each class). An internalizing class (n = 32; 15.4%) was defined by high probabilities of endorsing PTSD, GAD, SAD, AGO, PD, and MDD, and moderate to low probabilities of ODD and CD. Finally, an externalizing class (n = 24; 11.5%) was characterized by high probabilities of ODD and CD, moderate probability of MDD, and low probability of PTSD, GAD, SAD, AGO, and PD. The internalizing and externalizing classes, compared to the no-disturbance class, were used as additional outcomes in the analyses.

Functional Impairment

Participants reported the frequency (on a scale from 0 = *not at all* to 3 = *a lot of the time*) of seven impairment indicators that they may have experienced because of their feelings and/or behaviors in the most recent month: (1) parents felt worried/concerned about the child; (2) parents or (3) teachers got annoyed/upset with the child; (4) being unable to do things/go to places with the family or (5) with peers; (6) feeling bad/upset; (7) problems with schoolwork/grades.[21,35,36,38] Impairment indicators scored as "3" were coded as positive. Severe impairment (dichotomous outcome) was defined as endorsement of $\geq$2 indicators.[21,38] Total score (0 to 21) was also used in the analysis. To verify the clinical relevance of the psychiatric outcomes, we tested the association of impairment with symptom count for each disorder, the dichotomous outcome for each disorder (z-score $\geq$1 SD above the mean symptom count) used for LCA, and class membership from LCA (the internalizing and externalizing classes were compared to the no-disturbance class). Impairment

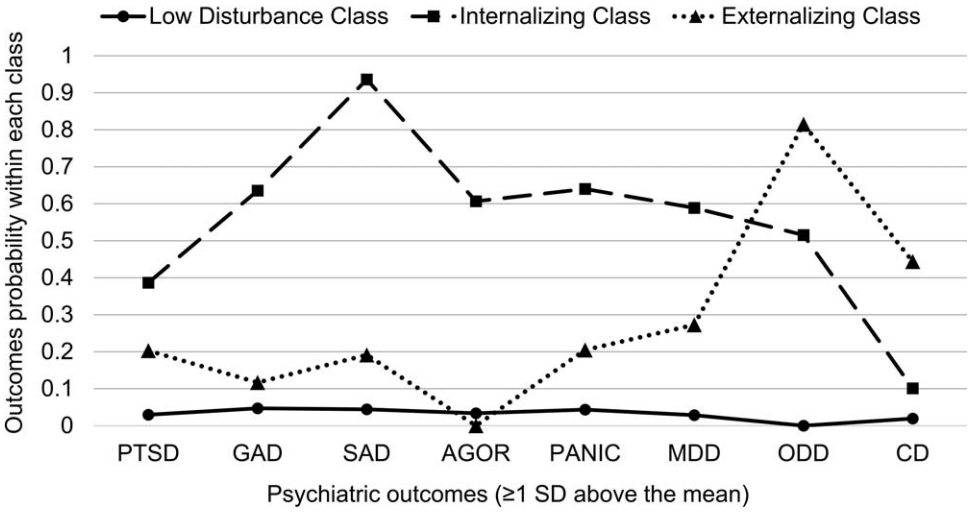

FIGURE 1. 3-Class model from latent class analysis: probability of psychiatric outcomes within each class. CD, conduct disorder; GAD, generalized anxiety disorder; MDD, major depressive disorder; ODD, oppositional defiant disorder; PD, panic disorder; PTSD, posttraumatic stress disorder; SAD, separation anxiety disorder.

scores and severe impairment were regressed on the psychiatric outcomes using the *MASS* package[39] in R[40]; Poisson and binomial regressions were used for impairment scores and for severe impairment, respectively. All regressions were adjusted for children's gender and age. As shown in Table 1, every psychiatric outcome was significantly associated either with impairment score or severe impairment or both, supporting the clinical relevance of the psychiatric outcomes examined in the study; the only exception was the dichotomous outcome for GAD which was only marginally associated with impairment score and not associated with severe impairment.

Data Analysis

Three sets of regression models were run with the *MASS* package[39] in R.[40]

(1) A first set of multiple regression models examined the association of parental work-related variables (paternal FR status,

TABLE 1. Descriptive Statistics (Mean, Standard Deviations, *n*, and Percentage of Sample) of Psychiatric Outcomes (Dependent Variables), and Association of Psychiatric Outcomes With Functional Impairment

					Imp. Score		Severe Imp.[a]	
Psychiatric Outcomes	**Mean**	**SD**	***n***	**%**	**Estimate**	**SE**	**Estimate**	**SE**
Child's psychiatric symptoms								
Posttraumatic stress disorder	0.67	1.69			0.22***	0.05	0.24*	0.11
Generalized anxiety disorder	1.47	1.8			0.24***	0.06	0.29*	0.13
Separation anxiety disorder	1.68	2.01			0.29***	0.06	0.27*	0.12
Agoraphobia	0.90	1.44			0.26***	0.07	0.21	0.16
Panic disorder			32	15.4	0.90**	0.29	0.82	0.62
Major depressive disorder	1.44	2.36			0.26***	0.03	0.29***	0.08
Oppositional defiant disorder	1.54	2.41			0.29***	0.04	0.43***	0.10
Conduct disorder	0.41	1.06			0.36***	0.06	0.62***	0.18
Child's dichotomous outcomes[a]								
Posttraumatic stress disorder			22	10.6	1.31***	0.29	1.28*	0.64
Generalized anxiety disorder			30	14.4	0.57‡	0.32	0.42	0.68
Separation anxiety disorder			41	19.7	1.35***	0.27	1.25*	0.58
Agoraphobia			24	11.5	1.04***	0.31	0.88	0.70
Panic disorder			32	15.4	0.90**	1.31	0.82	1.70
Major depressive disorder			30	14.4	1.69***	0.27	1.84**	0.57
Oppositional defiant disorder			38	18.3	1.51***	0.27	1.84**	0.56
Conduct disorder			18	08.7	1.41***	0.30	1.84**	0.63
Latent class analysis[b]								
Internalizing class			32	15.4	1.69***	0.34	1.73*	0.75
Externalizing class			24	11.5	1.95***	0.34	2.69***	0.69

Imp., impairment.
[a]Based on *z*-scores (≥1 SD above mean).
[b]The internalizing and externalizing classes were compared to the no-disturbance class ($n = 152$; 73.1% of subjects).
‡$P < 0.01$.
*$P < 0.05$.
**$P < 0.01$.
***$P < 0.001$.

paternal and maternal CIHQ scores) with two groups of psychiatric outcomes: symptom count for each disorder, and class membership from LCA (likelihood of belonging to classes displaying a higher probability of symptom endorsement, compared to the class with the lowest probabilities of symptoms endorsement). The three parental work-related variables were included together in the models; children's gender and age were also included in the analyses; Poisson and binomial regressions were used for symptom count for each psychiatric disorder and for class membership from LCA, respectively.

(2) Stepwise regressions examined the association between psychiatric outcomes and parental psychopathology (work-related PTSD symptoms, MDD symptoms, psychological distress), youth's direct exposure (DISC DSM-IV PTSD criterion A scale, traumatic events scale, positive and negative life events) and negative family environment (monitoring/attachment, family satisfaction, parent-child relationship). Children's gender and age were also included in the analyses. Stepwise selection was performed using the stepAIC function (option "*both*") from the *MASS* package; the function stepAIC performs stepwise model selection by exact AIC, and the selection procedure is automatically performed by the R package. Stepwise selection (or sequential replacement) is a combination of forward and backward selections. It starts with no predictors, then sequentially adds the most contributive predictors (like forward selection); after adding each new variable, it removes any variables that no longer provide an improvement in the model fit (like backward selection).

(3) To examine whether parental work-related variables are associated with their children psychiatric outcomes above and beyond parental psychopathology, youth's direct exposure and negative family environment, a final set of regressions examined the association between parental work-related variables and the children's psychiatric outcomes, adjusting for variables retained in[2] in each outcome-specific model.

TABLE 2. Descriptive Statistics (Means, Standard Deviations, *n*, and Percentage of Sample) of the Independent Variables Examined in the Study

Variables	Mean	SD	*n*	%
Parental work-related variables				
Paternal FR status (father is a FR)			108	51.9
Maternal CIHQ score	0.75	1.45		
Paternal CIHQ score	5.15	5.6		
Parental psychopathology				
Maternal PTSD score	17.14	1.12		
Paternal PTSD score	17.54	3.56		
Maternal K10 score	10.33	5.52		
Paternal K10 score	9.54	4.5		
Maternal BDI score	0.45	1.31		
Paternal BDI score	0.44	1.3		
Children's demographics				
Female gender	0.47	0.50		
Age	11.99	2.13		
Child's direct exposure				
Any DISC DSM-IV PTSD criterion A event			48	23.1
Any other traumatic event			46	22.3
Any "mostly bad" life event			78	37.9
Any "mostly good" life event			59	28.6
Child's functional impairment				
Impairment score	0.27	0.73		
Severe impairment[a]			15	7.2
Family environment				
Negative monitoring/attachment	4.04	1.49		
Negative family satisfaction	5.77	1.53		
Negative parent-child relationship	2.35	0.77		

[a]≥2 impairment indicators rated as 3.

RESULTS

The descriptive statistics for each independent variable are shown in Table 2. The descriptive statistics of psychiatric outcomes and the association between psychiatric outcomes and functional impairment are reported in Table 1. Paternal CIHQ scores were more than five times higher than maternal CIHQ scores; however, paternal and maternal measures of psychopathology had similar values and were in general low, relative to the possible range of values of each measure. Variables indexing children's exposure had frequencies in the range 22.3% to 37.9%. In general, the mean number of symptoms for each disorder was low. Among dichotomous psychiatric outcomes, ODD was the most prevalent (19.7%), while CD was the least prevalent outcome (8.7%). Finally, the mean values of variables measuring the family environment were low, relative to the possible range of values of each measure.

In the first set of multiple regressions (unadjusted models; Table 3), paternal FR status (having a father working as a FR) was negatively associated with child PTSD. Paternal cumulative exposure to work-related events (CIHQ score) was positively associated with an increased number of PTSD symptoms and with a higher likelihood of belonging to the externalizing class, compared to the likelihood of belonging to the low disturbance class. Maternal cumulative exposure to work-related events was positively associated with a higher number of symptoms of GAD, SAD, AGO, PD, MDD, and ODD, and with a higher chance of belonging to the externalizing class and to the internalizing class.

In the final models (Table 3), adjusting for covariates that were retained after stepwise regressions (see Table, Supplemental Digital Content 3, http://links.lww.com/JOM/A791, which shows the results of stepwise regressions), the association between paternal FR status and PTSD became non-significant; however, c; the relationship between maternal cumulative exposure to work-related events and SAD, AGO, and likelihood of belonging to the externalizing class was only marginally significant.

In the final models (Table 3), variables that were retained after stepwise regressions (see Table, Supplemental Digital Content 3, http://links.lww.com/JOM/A791) still showed significant relationships with the outcomes. First, parental psychopathology was significantly associated with their children's outcomes. Maternal and paternal PTSD were associated with children's PTSD; paternal PTSD was also associated with GAD, SAD, AGO, MDD, and ODD. Maternal and paternal K10 scores were associated with MDD. Maternal K10 scores were associated also with GAD, AGO and externalizing outcomes, such as ODD, CD, and likelihood of belonging to the externalizing class); paternal K10 scores were also associated with other internalizing outcomes, namely PTSD, SAD, PD, and likelihood of belonging to the internalizing class. Maternal and paternal BDI scores had the opposite effects on PTSD and CD; paternal BDI scores were negatively associated with PTSD, and positively associated with CD, while maternal BDI scores showed the reverse relationship. Second, family environment was also associated with childhood psychiatric outcomes (Table 3). Negative family satisfaction and negative parent-child relationship were associated with SAD, ODD, and likelihood of belonging to internalizing and externalizing classes 2 and 3. In addition, negative family satisfaction was associated with PTSD and CD, while negative parent-child relationship was associated with GAD, AGO, and MDD. No significant relationships with the outcomes were observed for negative monitoring/attachment. Finally, the children's own exposure to a variety of different events was associated with childhood psychiatric outcomes as well. Exposure to any DISC PTSD criterion A event was associated with PTSD, exposure to any traumatic events from the WTC-NYC Child and

TABLE 3. (1) Association Between the Outcomes (Symptoms of Psychiatric Disorders and Likelihood of Belonging to the Internalizing and Externalizing Classes, Compared to the No-Disturbance Class) and Parental Work-Related Variables; (2) Association Between the Outcomes and Parental Work-Related Variables, Adjusting for Variables Retained After Stepwise Regressions

	PTSD		GAD		SAD		AGO		PD		MDD		ODD		CD		Int. class		Ext. class	
Predictors	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**
(1) Models examining the associations between the outcomes and parental work-related variables[a]																				
Paternal FR status	−1.64*	0.25	−1.14	0.16	−1.24	0.15	−1.24	0.20	−1.69	0.57	−1.05	0.16	−1.22	0.16	−1.62‡	0.32	−1.02	0.59	−1.55	0.70
Paternal CIHQ score	−1.14***	0.02	−1.00	0.01	−1.01	0.01	−1.01	0.02	−1.02	0.05	−1.01	0.01	−1.02	0.01	−1.06*	0.03	−1.03	0.05	−1.13*	0.06
Maternal CIHQ score	−1.06	0.04	−1.10**	0.03	−1.09**	0.03	−1.11*	0.04	−1.36**	0.13	−1.15***	0.03	−1.14***	0.03	−1.02	0.07	−1.47**	0.15	−1.35*	0.17
(2) Models examining the associations between the outcomes and parental work-related variables, adjusting for variables retained after stepwise regressions																				
Parental work-rel. var.																				
Paternal FR status	−1.16	0.30	−1.19	0.16	−1.35*	0.15	−1.38‡	0.20	−1.30	0.63	−1.17	0.16	−1.00	0.16	−1.12	0.38	−1.04	0.76	−1.05	0.84
Paternal CIHQ score	−1.07***	0.02	−1.02‡	0.01	−1.01	0.01	−1.02	0.02	−1.06	0.06	−1.02	0.01	−1.01	0.01	−1.04	0.03	−1.03	0.07	−1.08	0.07
Maternal CIHQ score	−1.04	0.05	−1.07*	0.03	−1.06‡	0.04	−1.08‡	0.05	−1.38**	0.12	−1.11***	0.03	−1.12***	0.03	−1.08	0.07	−1.44*	0.19	−1.39‡	0.22
Child's demographics																				
Female gender	−1.00***	0.24	−1.05	0.12	−1.73***	0.12	−1.85***	0.16	−1.94‡	0.49	−1.28*	0.12	−1.02	0.13	−1.52‡	0.29	−1.55*	0.65	−1.56	0.62
Age	−1.03	0.05	−1.03	0.03	−1.12***	0.03	−1.10**	0.04	−1.08	0.11	−1.03	0.03	−1.09**	0.03	−1.09	0.07	−1.09	0.12	−1.22	0.15
Parental psychopathology																				
Maternal PTSD score	−1.25***	0.05			−1.04	0.03											−1.27	0.23		
Paternal PTSD score	−1.03*	0.01	−1.06***	0.01	−1.04***	0.01	−1.04**	0.01			−1.03*	0.01	−1.03*	0.01			−1.18‡	0.10		
Maternal K10 score			−1.06***	0.01			−1.04**	0.01			−1.05***	0.01	−1.07***	0.01	−1.08***	0.02			−1.15**	0.06
Paternal K10 score	−1.09***	0.03			−1.06***	0.02			−1.15**	0.05	−1.04**	0.01					−1.16**	0.06		
Paternal BDI score	−1.23*	0.09			−1.09‡	0.06									−1.27***	0.04				
Maternal BDI score	−1.25***	0.05			−1.14***	0.03	−1.11*	0.05	−1.34*	0.15					−1.20*	0.08	−1.51*	0.20		
Family environment																				
Negative monit./attach.																	−1.28	0.21	−1.36	0.23
Negative family satisf.	−1.20**	0.07			−1.09*	0.04							−1.15***	0.03	−1.27***	0.05	−1.43*	0.20	−1.36*	0.18
Negative parent-child rel.	−1.23	0.15	−1.22**	0.07	−1.26***	0.07	−1.34***	0.08			−1.50***	0.06	−1.55***	0.07			−1.79*	0.33	−1.17***	0.34
Child's direct exposure																				
Any DISC event[b]	−1.32***	0.22			−1.24	0.15									−1.46‡	0.27			−1.74	0.66
Any other traumatic event	−1.25	0.23							−1.12*	0.50	−1.45***	0.13								
Any negative life event	−1.45‡	0.23									−1.15	0.13								
Any positive life event	−1.45‡	0.23			−1.23‡	0.13	−1.50**	0.16												

CD, conduct disorder; ext. class, externalizing class; family satisf., family satisfaction; GAD, generalized anxiety disorder; int. class, internalizing class; MDD, major depressive disorder; monit./attach., monitoring/attachment; ODD, oppositional defiant disorder; parental work-rel. var., parental work-related variables; parent-child rel., parent-child relationship; PD, panic disorder; PTSD, posttraumatic stress disorder; SAD, separation anxiety disorder.

[a]Adjusted for child's gender and age.

[b]Any DISC DSM-IV PTSD criterion A event.

‡$P < 0.01$.

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.

Adolescent Questionnaire was associated with PD and MDD and experiencing any positive life event from the LEC was associated with AGO. No significant relationships with the outcomes were observed for exposure to any negative life event from the LEC.

DISCUSSION

To the best of our knowledge, the Children of First Responders Study is the first investigation specifically designed to assess psychiatric disorders in children of FRs. This report focuses on the Israeli sample of this two-site (NYC and Israel) study. In addition to eight individual psychiatric disorders, we also examined their patterns of comorbidity. It is important to emphasize that the mean symptom count for each disorder was relatively low; however, each psychiatric outcome (symptom count and dichotomous outcome for each disorder and class membership from LCA) was significantly associated with the impairment score and with severe functional impairment, suggesting that the endorsement of psychiatric symptoms in this population was clinically meaningful. It should also be noted that rates of PTSD in Israeli adolescents are no higher than in other countries, even with extensive exposure to terrorist acts and the ongoing regional conflict.[22,41] This may be partially explained by sociocultural characteristics of Israel, such as high social support and cohesion, a policy of fast return to one's usual routine after an attack, and little avoidance of trauma reminders, which result in negligible disruptions to daily life and reduction of psychosocial resources (eg, self-efficacy, social support, sense of control over one's life, social connections, social support).[22] These specific factors may hinder the generalizability of the present findings to families of FRs from other countries. Furthermore, comparisons to studies conducted in other populations are limited, since the Children of First Responders Study is the only study that comprehensively assessed psychiatric outcomes. In this regard, greater examination of the NYC sample of The Children of First Responders Study, which is underway, should shed light on whether the findings in the Israeli sample can be generalized to that sample. Notwithstanding the sociocultural and contextual variables that may buffer Israeli children and adolescents against psychological maladjustment in general, the examination of the relationship between parental work-related variables among FR's and child psychopathology led to six main findings.

First, maternal occupational exposure was significantly associated with a higher number of symptoms of GAD, PD, MDD, ODD and higher odds of belonging to the internalizing class, even though participating mothers were not FRs, and their average CIHQ score was more than five times lower than the average paternal CIHQ score; this association was independent of parental psychopathology, youth's own exposure to different types of traumatic and life events, and the family environment. Paternal exposure, on the other hand, was not associated with any of these outcomes. Compared to fathers, mothers are usually the primary caregivers; thus, children might experience higher exposure to, and be more aware of, maternal work-related stressful and traumatic events, and to related disturbances in parenting and mother-child relationships.[4] Importantly, studies that have examined parent gender, including studies of war veterans and Holocaust survivors, showed that maternal PTSD was more strongly associated with child psychopathology than paternal PTSD.[4] In addition to GAD, PD and MDD, the association between maternal cumulative exposure to work-related traumatic events and ODD symptoms in their offspring is noteworthy, given that empirical research and the high comorbidity rates among anxiety disorders and ODD suggest they share common etiologies.[42] It can be speculated that maternal exposure to work-related traumatic events might affect parental practices, leading to over-controlling parenting styles and reduced parental emotional expression and warmth, which have been shown to be transdiagnostic processes shared across anxiety disorders and ODD.[42] Furthermore, parents can influence their children's views of the world (eg, contribute to information processing biases) and emotion regulation processes; information processing deficits and emotion dysregulation are other etiological mechanisms underlying both anxiety disorders and ODD.[42] Thus, relative to fathers, maternal occupational exposure might be more likely to negatively affect the way exposed mothers shape the children's ability to regulate emotion and interpret situations and social cues. In sum, higher maternal exposure to work-related traumatic events might be associated with etiological processes underlying seemingly disparate disorders such as GAD, PD, MDD, and ODD.

Second, in final adjusted models, paternal, but not maternal, exposure to work-related traumatic events showed a significant relationship only with PTSD. This finding is probably not explained by increased odds of reporting traumatic events in association with higher paternal exposure since, in *post hoc* analyses, both paternal and maternal exposure were associated with increased odds of endorsing any traumatic event (estimate = 0.08, $SE = 0.04$, $P < 0.05$; estimate = 0.22, $SE = 0.11$, $P < 0.05$; respectively). One possible explanation is that the intrinsic dangerous nature of the father's FR job might increase the children's apprehension related to parental occupation, and therefore might increase the odds of endorsing other PTSD symptoms assessed in the study, such as problems falling or staying asleep, or difficulty concentrating. Interestingly, among children who had a relative involved in the manhunt following the Boston marathon attack, elevated fear that a loved one could be hurt during the manhunt mediated the relationship between familial involvement in the manhunt and poorer adjustment.[13] Also, as mentioned before, fathers who work as FRs have on average a much higher exposure to work-related traumatic events (CIHQ score) compared to mothers; thus, paternal exposure may be more likely to remind exposed children of their own exposure to traumatic events, and increase the probability of endorsing PTSD symptoms, such as avoidance of people who arouse recollections of the traumatic event and physiological reactivity on exposure to cues that made the respondent think about the traumatic event. None of the mothers in this sample was working as a FR and their average CIHQ score was low; thus, their work-related experiences might be less likely to act as trauma reminders among exposed children.

Third, in final adjusted models, paternal FR status was significantly associated only with SAD symptom count; paternal and maternal exposure were not associated with SAD symptoms. To our knowledge, no other studies have examined SAD in children of FRs or children of parents who work in high-risk occupation. However, in a representative sample of NYC students assessed in the aftermath of the WTC attack, the rate of probable SAD in youth who had a parent at the WTC ($n = 267$) and/or another relative the WTC ($n = 1239$), and therefore knew that the family member was potentially in danger on 9/11, was twice that in children who did not know anyone at the WTC on that day.[43] Also, in the current study, *post hoc* analysis showed that having a father working as a FR was mainly associated with a higher chance of reporting recurrent excessive distress when anticipating or experiencing separation from parents, reluctance/refusal to go to sleep without being near the parents, and physical symptoms (eg, headaches, stomachaches, nausea) when separation occurs or is anticipated. Interestingly, two of these symptoms—overt distress related to separation and reluctance to sleep separated from a major attachment figure (in addition to fear of being alone or without an attachment figure)—have been shown to best distinguish children with higher vs lower levels of separation anxiety.[44,45] Physiological separation anxiety naturally occurs between 6 and 12 months of age, is clearly observable approximately for the following 2 years, and steadily diminishes later on during development, without significant sex-related differences.[44] Importantly, SAD is a developmentally inappropriate and excessive manifestation of physiological separation anxiety,[2] and

therefore is linked to both normal and abnormal development; ''this supports a degree of continuity between adaptation and psychopathology, the differences being a matter of intensity of the manifestations, and appropriateness for age and context'' (Battaglia,[44] p. 279). Also, phases of exacerbation and remission of separation anxiety are common among children, and self-limiting periods of increased separation anxiety may represent the manifestation of temporary, and even possibly adaptive, reactions to specific environmental events.[44] Thus, among all the disorders assessed, it is not surprising that children of FRs endorsed a higher number of SAD symptoms, since this reaction might be temporary and appropriate for their age and family context. Nevertheless, given the continuity between transient and self-limiting physiological separation anxiety and clinical SAD, and evidence of heterotypic continuity indicating that childhood SAD may be associated with a heightened risk for the development of other disorders in adulthood, such as PD and AGO,[44] the finding that children of FRs report a higher number of SAD symptoms is relevant for the early identification of children who might be more likely to develop a full-blown SAD and/or other forms of future psychopathology.

Fourth, both in unadjusted regression models (except for PTSD) and in final adjusted models (except for SAD, as reported above), paternal FR status (having a father working as a FR) was not associated with the children's psychiatric outcomes. This non-significant relationship is interesting in light of previous findings in a large sample of children and adolescents showing that the prevalence of PTSD among children with family members working as firefighters was lower (5.6%) than the prevalence of PTSD (10.1%) among children with no FRs in the family[14]; in the same study, the highest prevalence of PTSD (18.9%) was observed among children with an EMT in their family. In the Israeli sample the majority of families of active-duty male FR were families of firefighters ($n = 72$), while families of EMTs were less than half ($n = 33$); thus, based on Duarte, Hoven, Wu, Bin, Cotel, Mandell, Nagasawa, Balaban, Wernikoff and Markenson[14] findings, the general lack of a significant relationship observed between paternal FR status and their children's outcomes may be driven by the larger proportion of firefighters families in the Israeli sample. Duarte, Hoven, Wu, Bin, Cotel, Mandell, Nagasawa, Balaban, Wernikoff and Markenson[14] suggested that differences between firefighters and EMTs related to career selection, pre-employment psychological status, recruitment and training practices, and co-worker support might explain their results; for example, strong support at work among firefighters may buffer against the effect of trauma exposure, whereas EMTs' irregular and unpredictable work schedules might limit their ability to cope with stress by relying on co-worker support. Aggregation of firefighters in families, the firefighter culture, transmitted across generations and associated with definite role expectations and acceptance (eg, the ''heroism'' attributed to being a firefighter) could be other explanations for the lower rate of PTSD in children of firefighters, compared to children of EMTs.[14] It should be noted that these considerations may apply only to firefighters and EMTs samples from the US, like the one examined by Duarte et al[14] Investigation of these hypotheses in Israeli samples might contribute to the development of interventions focused on enhancing resilience in children of firefighters, based on positive appraisal of their parents' occupation.

Fifth, for some psychiatric outcomes, the relationship between parental work-related factors and their children's psychiatric outcomes was not fully explained by potential mediators such as parental psychopathology, the family environment, and the children's own exposure. This was the case for the association between paternal CIHQ score and PTSD, and between maternal CIHQ score and GAD, PD, MDD, ODD and higher odds of belonging to the internalizing class, as the variables that were retained after stepwise selection in each outcome-specific final model did not considerably alter the strength of the association between parental work-related variables and these outcomes. Thus, to understand the relationship between parental work-related variables and these child's psychiatric outcomes, other potential mechanisms should be investigated; for example, emotion regulation, information processing, parenting style and parental emotional expressivity could be potential mechanisms to explain the relationship between maternal cumulative exposure to work-related traumatic events and GAD, PD, MDD, and ODD, as mentioned above. On the contrary, the association between paternal FR status and PTSD, and between maternal exposure and SAD, AG, and a higher likelihood of belonging to the externalizing class, were explained by the variables included in the respective final models for these outcomes. Thus, based on each outcome-specific model, variables related to parental psychopathology, the family environment, and the children's own exposure may be good candidates as potential factors to understand—and potentially intervene on—the specific associations between parental work-related variables and their children's psychiatric outcomes.

Sixth, surprisingly, higher paternal depression (BDI) scores showed an inverse association with their children's PTSD symptoms. Interestingly, in the New York sample of the Children of First Responders Study, Duarte, Eisenberg, Musa, Addolorato, Shen and Hoven[46] reported that maternal depression was correlated with inaccurate child knowledge of maternal exposure. Thus, a plausible explanation for the present finding is that paternal depression might reduce parent-child interactions and limit the child's awareness of paternal exposure to work-related traumatic events, which is positively associated with PTSD symptoms only. In other words, a higher paternal depression score might reduce the time that fathers and children spend together and therefore reduce the child's knowledge of parental exposure; this may limit the risk for secondary traumatization and exposure to trauma reminders and reduce the children's apprehension related to their fathers' job. In this Israeli sample, this explanation might be specific to PTSD, which was the only disorder associated with paternal exposure. In contrast, the maternal BDI score (and negative parent-child relationship) was associated with a higher number of GAD, PD, MDD, and ODD symptoms, and higher likelihood of belonging to the internalizing class; these outcomes were not associated with paternal exposure, but with maternal exposure only. These findings are in agreement with a study on the relationship between attack-related household discussions and child disaster-related PTSD symptoms among Boston-area youth following the Marathon bombing.[47] The participants showed better outcomes when informed by caregivers (rather than others) about the attack and manhunt, when their caregivers were confident about their safety, and when their caregivers did not avoid family discussions about the events or prevent others from discussing the events with their child. Children showed higher stress when their caregivers did not discuss the events in front of them, asked others to avoid discussing the events in front of them, and expressed concern that their child might not be safe.[47] Overall, our findings and previous findings by Carpenter, Elkins, Kerns, Chou, Greif Green and Comer[47] and Duarte, Eisenberg, Musa, Addolorato, Shen and Hoven[46] are consistent in showing that to fully understand and prevent youth's maladaptive psychological reactions to direct and indirect exposure to traumatic events it is crucial to take into account the family context.[4,47]

Study limitations should be noted. First, child and adult psychopathology were measured with non-diagnostic tools. Second, the time and duration of parental exposure to work-related events, and the time gap between exposures and current psychopathology among parents and children were not assessed. Third, the CIHQ Variety index focuses only on the number of different types of work-related traumatic events experienced. However, additional unmeasured exposure-related variables might contribute to parental psychopathology and to their children's outcomes.[5,48] Fourth, due to

lack of power (only three children had both parents exposed to at least one CIHQ event), we were unable to test whether occupational exposure among both parents, compared to only one, was more strongly associated with offspring outcomes. Fifth, differences between children of EMTs and children of firefighters were not examined due to lack of power. However, previous findings in a representative sample of NYC public school students assessed six months after 9/11 showed that frequencies of psychiatric disorders differed across children of firefighters, police officers and EMTs.[6,14] Sixth, potential child-driven effects on some variables included in this study (eg, parental psychopathology, monitoring/attachment, family satisfaction, parent-child relationship) were not examined, but could be important to better understand the relationship between parental and child psychopathology.[4] Finally, the cross-sectional, non-experimental analysis presented in this study precludes causal inferences or conclusions about temporal ordering of mediators and covariates, both of which represent critical areas of future inquiry.[49] For example, children's psychiatric outcomes were assessed with the previous year as timeframe, but questions about the family environment (monitoring/attachment, family satisfaction, parent-child relationship) were asked more generally, in the present, and were most likely understood by the children as occurring at the time of the interview; thus, there may be a bidirectional relationship between these two sets of variables, with children' psychiatric outcomes also potentially negatively impacting the family environment.

Despite these limitations, this study contributes to the small literature on mental health among children with relatives who work as FRs.[13–15] However, the sample of this study differs substantially from samples previously examined. Duarte, Hoven, Wu, Bin, Cotel, Mandell, Nagasawa, Balaban, Wernikoff and Markenson[14] and Comer, Kerns, Elkins, Edson, Chou, Dantowitz, Miguel, Brown, Coxe and Green[13] studied children with a family member who worked as a FR or participated in the manhunt following the Boston marathon attack, respectively; the current study—like that by Uchida, Feng, Feder, Mota, Schechter, Woodworth, Kelberman, Crane, Landrigan, Moline, Udasin, Harrison, Luft, Katz, Southwick and Pietrzak[15]—specifically focused on children of FRs. Furthermore, youth who participated in the studies by Uchida, Feng, Feder, Mota, Schechter, Woodworth, Kelberman, Crane, Landrigan, Moline, Udasin, Harrison, Luft, Katz, Southwick and Pietrzak[15] and Comer, Kerns, Elkins, Edson, Chou, Dantowitz, Miguel, Brown, Coxe and Green[13] were indirectly exposed to specific events (the WTC attacks and the manhunt following the Boston marathon attach, respectively), while in the present study we were interested in examining more broadly the relationship between children's psychiatric outcomes and their parents occupational exposure. Also, in the study by Comer, Kerns, Elkins, Edson, Chou, Dantowitz, Miguel, Brown, Coxe and Green,[13] children's relatives who were called to assist in the manhunt were law enforcement officers who were involved for a very limited time, since the manhunt for one of the suspect began and ended on April 19. Finally, Duarte, Hoven, Wu, Bin, Cotel, Mandell, Nagasawa, Balaban, Wernikoff and Markenson[14] examined children with any family member who worked as a FR; however, neither their involvement with 9/11 not their exposure to work-related stressful/traumatic events was known. The limitation of the current study, outlined above, and of the literature in general, should inform related future research questions.

First, childhood and adolescent psychopathology should be assessed with diagnostic instruments, to understand whether parental exposure to work-related traumatic events is associated with severe mental illness or only with an increase in psychiatric symptoms but still in the normal to sub-threshold range. Furthermore, the assessment of exposure to work-related traumatic events is more complex than that captured by the CIHQ, which measures only the frequency of exposure to each event and—with one item (participants report how difficult it would be for their coworkers to cope with each event)—the severity of exposure.[5] Also, future research should elucidate the differential effects of specific work-related traumatic events on offspring outcomes and tease apart the impact of specific events and the effect of repeated parental traumatization (cumulative exposure). Addressing this gap in the literature is important, given evidence that there are differences across studies on FRs in regard to which work-related traumatic events are rated as most severe, and that events rated as extremely severe are not necessarily the ones that FRs chose as PTSD triggering events.[5] This type of research should also be made in relation to children's outcomes.

Second, findings in the NYC sample of the Children of First Responders Study showed that children were often unaware of their parents' exposure to specific work-related traumatic events; parental occupation, parental psychopathology, parental level of exposure to 9/11, child's age and grouping of traumatic events (ie, child's knowledge of any event) influenced the accuracy of child's knowledge of parental exposure.[46] Future studies should investigate the role of childhood knowledge of parental exposure in explaining the association between parental exposure and children's psychiatric outcomes, and how this mediational effect might vary based on parental occupation and psychopathology, the intensity/severity of parental exposure, and the child's age.

Third, the effect of parental exposure to work-related events should be examined comparing children of parents who have different types of FR occupations. For example, in a representative sample of NYC public school students, among children without exposure to the WTC attack, those with EMTs as family members had the highest rate of 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 FR (7.5%); children with firefighters as family members had the lowest prevalence of probable PTSD (2.9%).[6] These findings suggest that the relationship between parental exposure and their children mental health might also depend on the specific FR jobs held by the parent. A child's appraisal of her/his parent's FR occupation might play a pivotal role in shaping the child's psychological responses to parental exposure.[6,14]

Fourth, as suggested in regard to understanding the impact of parental PTSD on their children's mental health,[4] research on the consequences of parental exposure will have to adopt a bidirectional approach to identify offspring characteristics (eg, temperament; personality traits) that influence and elicit certain environmental factors (eg, parenting behavior). In models of the etiology of psychiatric disorders, the direction of causality often goes from the environment to the individual, as noted by Kendler and Baker[50] in their review of the genetic influences on measures of the environment. The unidirectionality of this causal sequence has been increasingly challenged; in addition to be impacted by their environment, the notion that individuals actively select, change and create their environment is now commonly integrated in models of developmental psychopathology.[4,50,51]

Finally, in addition to gender-related difference, a greater emphasis on age-related differences is needed.[52] The offspring's age at the time of parental exposure and the time since parental exposure are important factors to understand the effects of secondary traumatization on children's mental health.[4] For example, in the present study, younger children reported a higher number of SAD symptoms, compared to older participants. Similarly, 6 months after September 11th, younger children in NYC had a higher prevalence of probable SAD, compared to older children and adolescents; among 4th and 5th graders, the frequency of probable SAD was almost three times greater than among 9th through 12th graders.[43] These findings suggest that younger children, who are more dependent on attachment figures than older children, may be more vulnerable to the effect of secondary traumatization and therefore more likely to develop SAD.

Parental exposure and psychopathology have been increasingly recognized as negative determinants of mental health in

children of military personnel, which has led to the development of specific interventions to prevent the risk of psychological maladjustment in children and families of members of the armed forces.[53] However, to the best of our knowledge, no intervention has been designed specifically for children of FRs. In general, the association between parental exposure and other familial variables with childhood psychiatric outcomes suggests that family-centered preventive approaches and specific coping skills for both the child and the parent to work on together might be useful in promoting resilience and psychological well-being in children of FRs. Lester, Liang, Milburn, Mogil, Woodward, Nash, Aralis, Sinclair, Semaan, Klosinski, Beardslee and Saltzman[53] showed that family-centered preventive approaches can effectively improve mental health in children at risk for negative outcomes across different contexts. In these interventions, family-level factors (eg, parenting behaviors, family coping mechanisms, etc) play key role in reducing the child's vulnerability to adverse outcomes.[53] Based on the findings of this study, and on what discussed above about the need to move away from unidirectional models of developmental psychopathology, a particularly interesting family-centered intervention is the Families Over Coming Under Stress (FOCUS) intervention. The FOCUS framework was developed for and successfully implemented in military families and children that experience high levels of stress due to parental deployment. Among parents, the FOCUS intervention achieved reduction of PTSD, anxiety and depression symptoms, and unhealthy family functioning; among children, the intervention reduced anxiety symptoms and improved emotional and behavioral symptoms and prosocial behaviors.[53] Based on evidence showing the reciprocal influences among family members, and between family members and the broader social context, the ecological model of FOCUS was conceived to reduce the impact of stress at the level of the family system, supporting not only the well-being of single individuals, but also their functioning within parent-parent and parent-child relationships.[53] Thus, unlike many family-centered intervention approaches, whose main goal is to prevent negative child outcomes, the FOCUS framework emphasizes how a family member's exposure to stressful and traumatic events can potentially negatively affect other family members and disrupt family relationships and the family unit.[53] Some of the core elements of the FOCUS intervention, outlined in detail in Lester et al,[53] might successfully reduce psychiatric symptoms and improve resilience and positive coping mechanisms also in families of FRs. These include (i) family psychoeducation about the impact of cumulative exposure to traumatic events on family members (eg, PTSD, physical injuries), and developmental guidance, with a focus on improving parenting practices and parent–child relationships; (ii) structured, graphic narrative timelines of subjective experiences related to key family transitions, to improve communication and understanding, and to develop a shared family narrative; and (iii) enhancement of resilience skills, such as problem solving, emotional regulation, and coping with trauma reminders. Through ''approaches that are designed to proactively strengthen the family system as a whole'' (Lester et al,[53] p. 22), this type of family-centered interventions could constitute a model for the implementation of preventive efforts also in families of FRs.

Furthermore, the association between maternal cumulative exposure to work-related traumatic events and seemingly disparate disorders such as PTSD, GAD, SAD, and ODD suggest that effective interventions might benefit from the inclusion of treatment components which target the previously discussed shared processes underlying these disorders, including emotion dysregulation, information processing deficits and specific parenting behaviors.[42] For example, given underlying transdiagnostic difficulties with emotion regulation, the emotional component of emotion-focused cognitive-behavioral therapy (ECBT), which combines emotion-focused interventions and cognitive behavioral therapy, could be particularly helpful for children who experience both internalizing symptoms and oppositionality.[42] In addressing underlying processes that may be shared between PTSD, GAD, SAD, and ODD, it might be beneficial to also consider treatments that intervene on both children and parents, such as the Collaborative Problem Solving (CPS) intervention. The potential benefits of the ECBT and CPS intervention to target several previously outlined processes shared across PTSD, GAD, SAD, and ODD are discussed in detail in Fraire and Ollendick.[42]

CONCLUSION

Extensive evidence indicates that children of parents with PTSD, trigged by exposure to different types of traumatic events, experience higher rates of mental health problems.[4] However, studies, and therefore public health awareness, on the association between parental exposure to traumatic events and their children's mental health in families of FRs are extremely limited. In this understudied population, the present work showed that parental work-related cumulative exposure is associated with both internalizing and externalizing psychiatric outcomes in the offspring, and that these associations are significant above and beyond relevant demographic, environmental, and familial factors. Promising family-centered interventions already exist for military families; research in children of FRs will be needed to adapt these interventions to this population, and ultimately inform specific preventive efforts.

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