

BRIEF REPORT

Posttraumatic Stress in Children With First Responders in Their Families*

Cristiane S. Duarte, Christina W. Hoven, and Ping Wu
Columbia University and New York State Psychiatric Institute

Fan Bin
New York State Psychiatric Institute

Sivan Cotel
Wesleyan University

Donald J. Mandell
Columbia University and New York State Psychiatric Institute

Megumi Nagasawa
New York State Psychiatric Institute

Victor Balaban
Macro International Inc.

Linda Wernikoff
New York City Department of Education

David Markenson
New York Medical College School of Public Health

High levels of exposure and occupational stress of first responders may have caused children in first-responder families to become traumatized following the September 11th, 2001 terrorist attacks. New York City public school children (N = 8,236) participated in a study examining mental health problems 6 months after the World Trade Center attack. Results revealed that children with emergency medical technician (EMT) family members had a high prevalence of probable posttraumatic stress disorder (PTSD; 18.9%). Differences in rates of probable PTSD among EMTs' and firefighters' children were explained by demographic characteristics. Where EMTs are drawn from disadvantaged groups, one implication of this study is to target EMT families in any mental health interventions for children of first responders.

*This article was edited by the journal's previous editor, Dean G. Kilpatrick.

Without the NYC-DOE (formerly BOE) leadership of Francine Goldstein, participation of Vincent Giordano, Linda Wernikoff, superintendents, principals, teachers, and, most of all, students, this study could not have succeeded. This investigation is the result of collaboration between the NYC-DOE; Children's Mental Health Alliance (Pamela Cantor); MSPH Columbia University-NYSPI; Christina W. Hoven (Principal Investigator), J. Larry Aber, Patricia Cohen, Christopher P. Lucas, Cristiane S. Duarte, Donald J. Mandell, George J. Musa, Ping Wu, Fan Bin, Ezra Susser, Judith Wicks, Renee Goodwin, Andrea Versenyi, and Barbara P. Aaron; statistical consultation Henian Chen, Mark Davies, Steven Greenwald and Patricia Zybert; The Michael Cohen Group, LLC (formerly ARC): Michael Cohen (Contract Principal Investigator), Nellie Gregorian, Chris Bumcrot, Craig Rosen and Victoria Francis; CDC: Bradley Woodruff; NCCEV, Yale University: Steven Marans; NYU: Elissa Brown; VA, Honolulu, HI: Claude Chemtob; University of Oklahoma: Betty Pfefferbaum; NCCTS, UCLA: Robert Pynoos, Alan Steinberg, William Saltzman.

Correspondence concerning this article should be addressed to: Cristiane S. Duarte, 1051 Riverside Drive, Unit #43, New York, NY 10032. E-mail: duartec@childpsych.columbia.edu.

© 2006 International Society for Traumatic Stress Studies. Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/jts.20120

First responders are frequently involved in high-stress, life-threatening situations, which puts them at elevated risk for becoming traumatized. Considering society's dependence upon first responders, it is important to understand how their occupation may impact their children.

Approximately 13% of first responders develop post-traumatic stress disorder (PTSD), according to studies conducted with convenience samples (North et al., 2002; Robinson, Sigman, & Wilson, 1997) using structured interviews measuring lifetime PTSD according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* (American Psychiatric Association, 1994). The same prevalence of PTSD was also identified 42 months after a disaster by an earlier study conducted in a representative sample of firefighters, using *DSM-III* criteria (APA, 1980; McFarlane & Papay, 1992). The prevalence estimated by previous investigations is potentially elevated when compared with the lifetime prevalence of PTSD (6.8%) recently reported in a national probability sample (Kessler, Berglund, Demler, Jin, & Walters, 2005). Even among persons directly exposed to a traumatic situation, the frequency of lifetime PTSD, assessed using DSM-IV criteria, was only 9.2% (Breslau et al., 1998).

Children in close contact with traumatized first responders may develop posttraumatic symptomatology through secondary traumatization. Parental psychological functioning has been identified as a predictor of children's mental health problems following disasters (e.g., Laor, Wolmer, & Cohen, 2001). More specifically, some studies have detected an association between PTSD among parents and their offspring (Stoppelbein & Greening, 2000; Yehuda, Halligan, & Bierer, 2001). Six months after the September 11th, 2001 terrorist attack on the World Trade Center (WTC), one factor associated with probable emotional disturbance in children throughout New York City was having a family member exposed to the attack (Hoven et al., 2002, 2005).

If exposure to trauma is common among first responders, and if such exposure has considerable impact on their children, then we would expect those children to be more susceptible to developing PTSD than their peers. However, is this statement true for all first responders, or are

some subgroups at higher risk than others? In this article, we examine children's posttraumatic stress reactions after September 11th, according to having different categories of first responders in their families. Our aim in these analyses is not only the identification of populations in need of special attention after a disaster, but also to contribute knowledge about how familiar exposure to trauma affects children.

METHOD

Participants

Participants included 8236 children and adolescents, ages 9 to 21. The sampling frame, developed in collaboration with the Centers for Disease Control (CDC), included all New York City public school students in grades 4–12 (716,189) 6 months after September 11, 2001, and was designed to accurately represent this (non-special education) population, oversampling specific areas, such as Ground Zero (Hoven et al., 2005). By grade group, compliance among those in school on the day of the survey, ranged from 69.0% (fourth to fifth graders) to 95.8% (sixth to eighth graders).

Measures

A self-report questionnaire was used (Hoven et al., 2002), with probable PTSD assessed by the PTSD screening module of the Diagnostic Interview Schedule for Children (DISC) DISC Predictive Scales (DPS) (Lucas et al., 2001). Psychometrics of the DPS PTSD scale were adequate (sensitivity = 85% and specificity = 98.4%). Post-traumatic stress disorder symptoms present in the past month were evaluated, with the WTC attack as the anchoring traumatic event.

Information about family members' occupations was obtained through the question "Does anyone in your family work as . . ." followed by a list of options. Multiple responses were acceptable and they included police officers (PO), firefighters (FF) and emergency medical technicians (EMT).

Children's exposure to trauma was measured by (a) previous exposure, defined as exposure to traumatic situations before September 11 (Saltzman et al., 1999); (b) attendance in a Ground Zero Area school; (c) direct exposure, defined as two or more of the following types of exposure: personally witnessing the attack, being hurt in the attack, being in or near the cloud of dust and smoke, having to be evacuated to safety, or being extremely worried about the safety of a loved one; (d) family exposure, defined as having a family member killed or injured in the attack, or witnessing the attack but having escaped unharmed; and (e) high TV exposure, child spent a lot of time watching attack coverage on the TV (Hoven et al., 2005). Demographic variables included gender, age, race/ethnicity, maternal education and family composition.

Data Analysis

Children were divided into five mutually exclusive groups, according to information about relatives' occupations: those with at least one family member who was a (a) police officer (PO) (but not EMT or FF); (b) EMT (but not PO or FF); (c) a FF (but not EMT or PO); (d) those with family members in at least two of the three possible first-responder occupations; and (e) no first responder in the family. Descriptive information about PTSD, demographics, and exposures among children with family members in different first-responder groups is presented (Table 1). The association between type of first responder in children's families and prevalence of probable PTSD was assessed through hierarchical logistic regression, controlling for exposures and demographics (Table 2). Statistical analysis was performed using SUDAAN software (version 8.0; Research Triangle Institute, 2001) to account for the complex sampling design.

RESULTS

Of 8,236 participants, 53.1% were female. The most represented ethnicity was Latino (40.1%), followed by African American (27.9%), White (13.4%), Asian (12.8%), and

Mixed/Other (5.7%). In the total sample, 15.5% had at least one first-responder family member.

The highest rate of probable PTSD (18.9%) occurred in children with EMT family members (Table 1). The rate among children who had PO family members (10.6%) was similar to that among children without any first responder (10.1%), whereas children with FF family members had the lowest prevalence of probable PTSD (5.6%).

Groups were roughly comparable regarding attendance in Ground Zero schools, direct and TV exposure. However, those with EMT family members or at least two of the first responder professions in their families had high levels of prior exposure. In addition, family exposure was less frequent among children with only POs or no first responders in their family. Most children with EMT family members were non-White (92.4%); about two thirds of the FFs' children were White (62.5%). Almost one third of children with EMT family members were in the youngest age group and 46.6% did not live with both parents (Table 1).

Table 2 reports the results of logistic regression analysis of probable PTSD. When being the child of a first responder was considered (model 1), children from all groups were less likely to have probable PTSD compared to children who had an EMT family member (reference group), although the results were only statistically significant for children of FFs and marginally significant for those without a first responder in their family ($p = .0516$). When controlling for different types of exposure (model 2), children with FFs in their family were still less likely than children with EMTs in their family to have probable PTSD. However, the introduction of demographic variables (model 3) resulted in the adjusted odds ratio for this comparison being only marginally significant ($p = .07$).

DISCUSSION

This appears to be the first study to assess mental health problems in children with different categories of first responder family members. We observed a high rate of probable PTSD among children with EMT family members in a representative sample of NYC public school students 6 months after the WTC attack. Further analysis suggested

Table 1. Prevalence (%) of Posttraumatic Stress Disorder (PTSD) (Probable), Exposure, and Demographics Among NYC Public School Students With First-Responder (FR) Family Members ($N = 8,236$)^a

PTSD, Exposure and Demographics	Family member occupation				
	Police Officer only $n = 670$	EMT only $n = 288$	Firefighter only $n = 83$	At least 2 FRs $n = 237$	No FRs in the family $n = 6,957$
PTSD (probable)	10.6	18.9	5.6	17.0	10.1
Prior trauma exposure	32.6	42.2	31.2	44.6	29.4
Attendance in Ground Zero area school	0.7	0.5	1.1	0.5	1.4
Direct World Trade Center exposure	29.5	30.0	30.6	35.6	23.4
Family World Trade Center exposure	12.2	21.1	27.5	26.6	11.5
World Trade Center TV exposure	64.2	68.6	72.6	73.1	62.6
Gender					
Girls	55.2	53.6	56.0	62.2	52.6
Race/Ethnicity					
White (non-Hispanic)	11.2	7.6	62.5	20.6	13.0
African American	33.5	40.3	13.9	31.4	27.0
Latino	45.7	39.8	19.5	40.8	39.8
Asian	3.4	5.3	0.2	3.5	14.6
Mixed/other	6.2	7.0	3.8	3.7	5.7
Grade					
4th–5th	21.4	32.3	17.5	16.2	25.8
6th–8th	36.5	29.4	30.3	41.4	33.4
9th–12th	42.1	38.3	52.2	42.4	40.8
Low maternal education	14.7	13.1	14.2	11.6	17.7
Not living with both parents	44.0	46.6	21.7	41.1	38.1

^aWeighted data.**Table 2.** Logistic Regression Models Predicting Probable Posttraumatic Stress Disorder (PTSD) Among Children With First Responder (FR) Family Members

First Responder (FR) Group	Probable PTSD					
	Model 1 FR		Model 2 FR + exposure ^a		Model 3 FR + exposure + demographics ^b	
	OR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
EMTs (Reference group)	1.00		1.00		1.00	
Police Officers	0.51	(0.21, 1.26)	0.56	(0.21, 1.46)	0.62	(0.23, 1.68)
Firefighters	0.26	(0.08, 0.79)	0.23	(0.07, 0.76)	0.30	(0.08, 1.08)
At least 2 FRs	0.88	(0.32, 2.40)	0.76	(0.26, 2.19)	0.88	(0.30, 2.62)
No FR in the family	0.48	(0.23, 1.01)	0.57	(0.26, 1.26)	0.58	(0.26, 1.27)

Note. Weighted data. OR = odds ratio; AOR = adjusted odds ratio; CI = confidence interval. Results for the complete model are available upon request.

^aControlling for being in a Ground Zero school, direct, family, prior, and media exposures. ^bControlling for all exposures, plus gender, age, ethnicity, maternal education, and single-parent family.

that the high rates of PTSD observed in children with EMT family members are explained by a combination of their exposure to the WTC attack and sociodemographic characteristics.

Exposure to trauma might have a strong impact on EMTs themselves. For example, 21% of ambulance workers in a UK study had PTSD resulting from their chronic exposure to trauma (Clohessy & Ehlers, 1999). Moreover,

EMT/paramedics have been found to have higher distress levels compared with police and fire personnel, in a sample that combined first responders who had been chronically exposed to trauma with people exposed to a specific disaster (Marmar et al., 1996).

More detailed analysis revealed that the possible differences in risk of probable PTSD among EMT children, compared to children in families with no first responders, was mostly explained by differences in WTC attack exposure. Compared to children with FFs in their families, a great part of the elevated risk among children with EMTs in their families could be attributed to demographics. However, given the marginal statistical significance of this result, and the small sample size of the group of children with FF relatives, other factors might also be relevant.

Career selection, pre-employment psychological status, recruitment practices, training, and work group support may help to explain the study's findings. For example, EMTs' erratic work schedules might hinder their ability to rely on co-worker support as a stress coping mechanism (Spitzer & Neely, 1992), whereas strong co-worker support might contribute to FFs' lower risk to the effects of trauma exposure (Fullerton, McCarroll, Ursano, & Wright, 1992; North et al., 2002; Renck, Weisaeth, & Skarbo, 2002). The lower rate of PTSD in children of FFs might be associated with the aggregation of FFs in families. The FF culture, adopted across generations, may also be translated into clear role expectation and acceptance. The "heroism" associated with being a FF might also be important in helping FFs' children cope with stress. Such a hypothesis warrants investigation, as it might help to develop interventions to foster resilience based on children's positive appraisal of a family member's occupation.

Because of the nature of our survey, certain questions remain unanswered. For example, it was not possible to ascertain the total number of first responders in a child's family or the precise relationship between the child and first-responder family member. It also would have been helpful to have demographic and specific additional exposure information and mental health status of the first-responder relatives. Differences in first-responder groups'

sample sizes may also have interfered with the precision of the results.

The clinical and public health relevance of this study should be considered. First, if this study's findings are confirmed, evidence will be available supporting the need, after a mass disaster occurring in a similar context, to direct attention to the mental health of children of EMTs. In addition, these results indicate interesting directions for us to expand our investigation about mechanisms related to transmission of trauma within a family and its prevention, by suggesting that children's traumatization might be influenced by factors besides their own or their parent's level or type of exposure to a disaster.

REFERENCES

- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Breslau, N., Kessler, R. C., Chilcoat, H. D., Schultz, L. R., Davis, G. C., & Andreski, P. (1998). Trauma and posttraumatic stress disorder in the community: The 1996 Detroit Area Survey of Trauma. *Archives of General Psychiatry*, *55*, 626–632.
- Clohessy, S., & Ehlers, A. (1999). PTSD symptoms, response to intrusive memories and coping in ambulance service workers. *British Journal of Clinical Psychology*, *38*, 251–265.
- Fullerton, C. S., McCarroll, J. E., Ursano, R. J., & Wright, K. M. (1992). Psychological responses of rescue workers: Fire fighters and trauma. *American Journal of Orthopsychiatry*, *62*, 371–378.
- Hoven, C. W., Duarte, C. S., Lucas, C. P., Mandell, D. J., Cohen, M., Rosen, C., et al. (2002). Effects of the World Trade Center attack on NYC public school students—Initial report to the New York City Board of Education. New York: Columbia University Mailman School of Public Health, New York State Psychiatric Institute, and Applied Research and Consulting, LLC, New York City.
- Hoven, C. W., Duarte, C. S., Lucas, C. P., Wu, P., Mandell, D. J., Goodwin, R. D., et al. (2005). Psychopathology among New York City public school children six months after September 11. *Archives of General Psychiatry*, *62*, 545–552.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions

- of DSM-IV disorders in the National Comorbidity Study Replication. *Archives of General Psychiatry*, 62, 593–602.
- Laor, N., Wolmer, L., & Cohen, D. J. (2001). Mothers' functioning and children's symptoms 5 years after a SCUD missile attack. *American Journal of Psychiatry*, 158, 1020–1026.
- Lucas, C. P., Zhang, H., Fisher, P. W., Shaffer, D., Regier, D. A., Narrow, W. E., et al. (2001). The DISC Predictive Scales (DPS): Efficiently screening for diagnoses. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 443–449.
- Marmar, C. R., Weiss, D. S., Metzler, T. J., Ronfeldt, H. M., & Foreman, C. (1996). Stress responses of emergency services personnel to the Loma Prieta earthquake Interstate 880 freeway collapse and control traumatic incidents. *Journal of Traumatic Stress*, 9, 63–85.
- McFarlane, A. C., & Papay, P. (1992). Multiple diagnoses in posttraumatic stress disorder in the victims of a natural disaster. *The Journal of Nervous and Mental Disease*, 180, 498–504.
- North, C. S., Tivis, L., McMillen, J. C., Pfefferbaum, B., Spitznagel, E. L., Cox, J., et al. (2002). Psychiatric disorders in rescue workers after the Oklahoma City bombing. *American Journal of Psychiatry*, 159, 857–859.
- Renck, B., Weisaeth, L., & Skarbo, S. (2002). Stress reactions in police officers after a disaster rescue operation. *Nordic Journal of Psychiatry*, 56, 7–14.
- Research Triangle Institute. (2001). *Sudaan user's manual, Version 8.0*. Research Triangle Park, NC: Author.
- Robinson, H. M., Sigman, M. R., & Wilson, J. P. (1997). Duty-related stressors and PTSD symptoms in suburban police officers. *Psychological Reports*, 81, 835–845.
- Saltzman, W. R., Layne, C. M., Pynoos, R. S., Steinberg, A. M., & Aisenberg, E. (1999). *UCLA Adolescent trauma exposure survey*. Los Angeles: UCLA Trauma Psychiatry Program.
- Spitzer, W. J., & Neely, K. (1992). Critical incident stress: The role of hospital-based social work in developing a statewide intervention system for first-responders delivering emergency services. *Social Work In Health Care*, 18, 39–58.
- Stoppelbein, L., & Greening, L. (2000). Posttraumatic stress symptoms in parentally bereaved children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 1112–1119.
- Yehuda, R., Halligan, S. L., & Bierer, L. M. (2001). Relationship of parental trauma exposure and PTSD to PTSD, depressive and anxiety disorders in offspring. *Journal of Psychiatric Research*, 35, 261–270.