

A Prospective Cohort Study of the Effectiveness of Employer-Sponsored Crisis Interventions after a Major Disaster

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ABSTRACT: *Postdisaster crisis interventions have been viewed by many as the appropriate and immediate approach to enhance psychological well-being among persons affected by large-scale traumatic events. Yet, studies and systematic reviews have challenged the effectiveness of these efforts. This article provides the first rigorous scientific evidence to suggest that postdisaster crisis interventions in the workplace significantly reduced mental health disorders and symptoms up to 2 years after the initial interventions. Until now, studies have neither focused on the effectiveness and safety of brief mental health services following disasters, or traumatic events generally, nor examined the long-term impact of these interventions across a spectrum of outcomes using a rigorous research design. The focus of this study was to examine the impact of brief mental health crisis interventions received at the worksite following the World Trade Center disaster (WTC) among a random sample of New York adults. The data for the present study come from a prospective cohort study of 1,681 adults interviewed by telephone at 1 year and 2 years after this event. Results indicate that worksite crisis interventions offered by employers following the WTC had a beneficial impact across a spectrum of outcomes, including reduced risks for binge drinking, alcohol dependence, PTSD symptoms, major depression, somatization, anxiety, and global impairment, compared with individuals who did not receive these interventions. In addition, it appeared that 2-3 brief sessions achieved the maximum benefit for most outcomes examined. Implications for postdisaster crisis interventions efforts are discussed. [International Journal of Emergency Mental Health, 2005, 7(1), pp. 9-22].*

KEY WORDS: *crisis interventions, emergency services, Critical Incident Stress Management, CISM, community disasters, alcohol abuse, depression, PTSD, mental health services, effectiveness study, outcomes research.*

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For many persons exposed to psychological trauma, these events often occur suddenly and unexpectedly, particularly when due to such events as homicides, suicides, motor vehicle accidents, and natural and man-made disasters. Although the psychological sequelae following these events often appear brief, studies suggest that community-wide disasters characterized by large-scale loss of life, extensive property damage, economic disruptions, and those related to human intent, result in increased rates of mental health problems and psychological distress (Brewin, Andrews, & Valentine, 2000; Bromet & Dew, 1995; Green,

1991; Noji, 1997; Norris, 1992; North et al., 1999; Rubonis & Bickman, 1991). All of these elements were present in the terrorist attacks on the World Trade Center in New York City (NYC) on September 11, 2001 (Boscarino, Galea, Ahren, Resnick, & Vlahov, 2002; Centers for Disease Control and Prevention [CDC], 2002; Galea et al., 2002). Research 6-months postdisaster suggested that while these symptoms resolved over time, many persons not directly affected by the attacks developed some symptoms (Boscarino, Galea, et al., 2004; Galea et al., 2003). Paradoxically, however, initial surveys after this event indicated that only small population-level increases occurred in mental health service utilization (Boscarino, Galea, Ahern, Resnick, & Vlahov, 2002; Boscarino, Galea, Ahern, Resnick, & Vlahov, 2003; Boscarino, Galea, et al., 2004).

Thus, despite the availability of mental health services in the NYC area following the attacks, major increases in mental health treatment-seeking failed to materialize (Boscarino, Adams, & Figley, 2004). While postdisaster mental health service utilization has been documented before the World Trade Center disaster (WTCD) (Boscarino et al., 2002), few studies have focused on population-level services utilization (Burkle, 1996; Gleser, Green, & Winget, 1981), which is required for disaster planning and preparedness. Within this context, to our knowledge few studies have focused on the effectiveness and safety of brief mental health services following disasters that might effectively mitigate the harmful effects of these events, or traumatic events generally. Moreover, as we note below, existing crisis intervention studies have failed to examine the long-term impact of these interventions across a spectrum of mental health outcomes and, in addition, rarely have done this using a rigorous observational research design.

The focus of this study was to examine the impact of brief mental health crisis interventions received by New Yorkers at the worksite following the WTCD event. Our investigation was part of a larger, federally-funded program of research focusing on the immediate and long-term effects of the WTCD among NYC residents. For the current study, specifically, we wanted to investigate whether participation in worksite crisis intervention services provided by area employers had a positive or negative long-term impact among the participants. As discussed below, we defined worksite crisis intervention as any brief sessions related to coping with the World Trade Center disaster shortly after

this event directed by a mental health professional or counselor arranged by area employers for their employees.

These crisis interventions included what is generally termed “Critical Incident Stress Management” (CISM) (Boudreaux & McCabe, 2000), psychological debriefing (Kaplan, Iancu, & Bodner, 2001), and other focused, short-term interventions designed to provide emergency mental health services for trauma victims (Everly, Flannery, & Mitchell, 2000; Flannery & Everly, 2004; Mitchell, 2004). In the current study, approximately 7% of New Yorkers reported receiving brief crisis interventions at the worksite following the WTCD attacks.

Crisis interventions following traumatic events have been utilized for many years (Boudreaux & McCabe, 2000; Kaplan et al., 2001; Mitchell, 2004). However, the effectiveness and safety of these interventions following these events have been debated (Castellano, 2003; Flannery & Everly, 2000; Hokanson & Wirth, 2000; Jacobs, Horne-Moyer, & Jones, 2004; Kaplan et al., 2001; Luna, 2002; Mitchell, 2003). Nevertheless, group crisis interventions are commonly recommended following traumatic events (Flannery & Everly, 2004; Mitchell, 2004). Unfortunately, the true impact of these interventions has been hampered by both mixed study results (Bledsoe, 2003; Flannery & Everly, 2004) and, by conventional epidemiological standards, a lack of methodological research rigor for the studies actually conducted (Hulley et al., 2001).

METHODS

Study Participants

The data for the present study come from a prospective cohort study of English- or Spanish- speaking NYC adults who were living in NYC on the day of the WTCD. Using random-digit dialing, we conducted a baseline telephone survey a year after the attacks. Upon reaching a person at a residential telephone number, interviewers obtained verbal consent for the survey. If more than one eligible adult lived in the household, interviewers selected one based on the person with the most recent birthday. As part of the overall study, we over-sampled residents who reported receiving any mental health treatment in the year after the attacks. The population was also stratified by the 5 NYC boroughs and sampled proportionately. Questionnaires were translated into Spanish and then back-translated by bilingual Americans to ensure the linguistic and cultural appropriateness of the sur-

vey. Interviews for the baseline survey occurred between October and December 2002. For the follow-up survey, we attempted to re-interview all baseline participants one year later (i.e., 2 years after the WTCD). All follow-up interviews occurred between October 2003 and February 2004.

The data collection procedures were the same for both survey waves. Trained interviewers using a computer-assisted telephone interviewing system conducted the interviews. All interviewers were supervised and monitored by the survey contractor in collaboration with the investigative staff. A protocol was in place to provide mental health assistance to participants who required psychiatric counseling. The mean duration of the interviews was 45 minutes for the baseline and 35 minutes for follow-up interviews. The Institutional Review Board of The New York Academy of Medicine reviewed and approved the study's protocols.

For the baseline, 2,368 individuals completed the survey. We were able to re-interview 1,681 of these respondents in the follow-up survey. Approximately, 7% of the interviews were conducted in Spanish in the baseline and 5% in the follow-up survey. Using industry standards (American Association for Public Opinion Research, 2000), the baseline cooperation rate was approximately 63% (Boscarino, Adams, et al., 2004), and the re-interview rate for the follow-up study was 71%. A sampling weight was developed for each wave to correct for potential selection bias related to the number of telephone numbers and persons per household and for the over-sampling of treatment-seeking respondents. In addition, as we discuss below, demographic weights were used for the follow-up survey data to adjust for differences in response rates by different demographic groups.

An analysis comparing our weighted baseline sample to the Census data for NYC indicated no differences for age, gender, race, or NYC Borough (Adams & Boscarino, 2005). Thus, the baseline sample appeared to be representative of NYC and was not demographically biased due to the cooperation rate or sample selection. When we compared responders for the follow-up survey to non-responders (unweighted), however, we found Whites, older respondents, and women more likely to participate in this survey, which is not uncommon for longitudinal surveys (Kessler, Little, & Groves, 1995).

To correct for this potential bias, we adjusted our follow-up data for these differences using sampling weights derived

from baseline data—the recommended method in this situation (Groves et al., 2004; Kessler et al., 1995). After weighting, a comparison between the baseline and the follow-up samples indicated no differences for age, gender, race, or NYC Borough, indicating that the weights corrected for differing participation rates for these four demographic groups. All analyses were conducted applying these weights, which allowed us to treat the longitudinal sample as a random, representative sample of NYC adult residents living in NYC on the day of the WTCD.

Health Outcomes Assessed

In our analyses, we included outcome measures related to both alcohol abuse and mental health status. Consistent with previous surveys and standardized measures used in epidemiologic studies of alcohol abuse (Allen & Columbus, 1995; Grieger, Fullerton, & Ursano, 2003), in the follow-up survey we asked respondents how many times during the past year they had 6 or more alcoholic drinks on a single occasion to measure binge drinking behaviors. We then classified this response as less than “monthly/never” (coded 0) and “monthly or more” (coded 1). In the follow-up survey we also inquired about the respondent's consumption of alcoholic beverages based on the CAGE criteria for alcohol dependence (Magruder-Habib, Stevens, & Alling, 1993), a widely used and validated scale for alcoholism screening (King, 1986). Using these data, we defined respondents as meeting criteria for alcohol dependence if they had 2 or more positive responses on the CAGE scale (e.g., criticized about drinking, drank first thing in the morning, etc.). We then created a variable for meeting the CAGE criteria for the 12 months between the baseline and the follow-up interviews (coded 1) and not meeting the CAGE criteria during this period as the reference group (coded 0).

Our third study outcome related to symptoms for PTSD assessed during the follow-up survey. Since there were relatively few respondents who met full DSM-IV (American Psychiatric Association [APA], 1994) criteria for past year PTSD, we assessed a broader measure commonly referred to as sub-clinical or partial-PTSD. This measure has been described in detail elsewhere (Breslau, Lucia, & Davis, 2004). Essentially, respondents met criteria for sub-clinical PTSD if they experienced at least one symptom from each symptom group (B, C, and D) and the symptoms lasted at least one month in duration. We used this measure to identify individuals who suffered from PTSD symptoms but

did not necessarily meet full criteria. Although these cases fail to meet the full criteria for PTSD, they nevertheless have significantly more impairment and problems with work and social relationships than those with few or no PTSD symptoms (Breslau et al., 2004). Thus, we utilized this partial PTSD measure as an indicator of psychological problems related to trauma exposure.

Our PTSD measure was developed for telephone administration and used in previous national surveys (Kilpatrick et al., 2003; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993) as well as in recent WTCD studies (Boscarino et al., 2002; Boscarino et al., 2003; Boscarino, Adams, et al., 2004; Boscarino, Figley, et al., 2004; Boscarino, Galea, et al., 2004). Cronbach's alpha for the symptoms used in this scale was 0.90 (Boscarino et al., 2002). In addition, data related to the validity of our PTSD scale have been previously reported and suggest that this scale can successfully diagnosis PTSD (Boscarino, Adams, et al., 2004; Kilpatrick, et al., 1998). To date, versions of this PTSD scale have been used in mental health surveys involving over 15,000 telephone interviews (Acierno et al., 2000; Boscarino, Adams, et al., 2004; Boscarino, Figley, et al., 2004; Boscarino, Galea, et al., 2004; Galea et al., 2003; Kilpatrick et al., 2003; Resnick et al., 1993).

Our fourth outcome measure in the follow-up survey assessed the occurrence of major depression in the past year. To classify respondents for this diagnosis, we used a version of the SCID's major depressive disorder scale from the non-patients version (Spitzer, Williams, & Gibbon, 1987), which has also been used in telephone-based population surveys (Acierno et al., 2000; Boscarino, Adams, et al., 2004; Boscarino, Figley, et al., 2004; Boscarino, Galea, et al., 2004; Galea et al., 2002; Kilpatrick et al., 2003). Following DSM-IV criteria (APA, 1994), respondents met the criteria for depression if they had five or more depression symptoms for at least two-weeks in the past 12 months. In the current study, Cronbach's alpha for the 10 symptoms used in this scale was 0.87. Data related to the validity of this scale were also previously reported and suggested that this scale can successfully diagnose depression in the general population (Boscarino, Adams, et al., 2004; Boscarino, Figley, et al., 2004; Boscarino, Galea, et al., 2004).

In our follow-up, we also assessed the occurrence of 3 psychiatric syndromes in the past 30 days based on the Brief Symptom Inventory-18 (BSI-18), a self-reported psychiatric scale derived from the Hopkins Symptom Checklist (Derogatis,

2001). The measure contained 18 items divided into 4 subscales relating to somatization, anxiety, depression, and global severity. For the current study, we present results for the somatization, anxiety, and the global severity scales. The BSI-18 has been standardized based on a national community sample and has clinical T-scores to define cases. We used a T-score of 65 or higher for case definition, representing a symptom score above the 90th percentile. Cronbach's alphas for BSI-18 scales range from 0.74 to 0.89 and test-retest correlations range from 0.68 to 0.90 (Derogatis, 2001). The BSI-18 has been validated against the widely used SCL-90R psychiatric scale and has been shown to have diagnostic properties consistent with this instrument (Derogatis, 2001).

Crisis Interventions Assessed

Since assessing the effects of brief crisis interventions at the work site was a key component of our study design, the survey queried respondents about participation in this type of service during the baseline survey. Specifically, we asked, "Since the World Trade Center disaster, have you attended any brief sessions related to coping with the World Trade Center disaster conducted by a mental health professional or counselor that were arranged by your employer or an organization such as a community group or religious group?" The overwhelming majority who attended these sessions (70%) indicated that they were at the worksite. We classified respondents who attended these worksite sessions as the brief crisis intervention group ($n = 180$) and all others as the non-intervention group ($n = 1,501$). (Those attending brief crisis interventions at other locations only were not classified as worksite crisis intervention cases.)

We also inquired about the number of times the respondent attended these brief sessions and the content of the sessions attended (e.g., educated you about severe stress symptoms, taught you to relax, discussed the event, had you think about the event, etc.). Based on the number of reported sessions attended, respondents were classified into the following categories: no worksite session attended ($n = 1,501$); one session attended ($n = 82$); 2-3 sessions attended ($n = 68$); and 4 or more worksite sessions attended ($n = 30$), with no worksite sessions attended designated as the reference category. Finally, we asked the treatment group to what extent these brief sessions help them deal with emotional problems they may have had since the WTCD. The response categories were "not at all," "a little," "some," and "a lot."

Study Control Variables

Since this was a population-based, observational study design without random assignment to treatment or control groups, we statistically controlled for potential selection bias and confounding variables that could have affected our results (Cohen & Cohen, 1983; Hulley et al., 2001). These included demographic factors, history of stressor exposures, mental health history, and psychological resource factors. It should be noted, however, that since these worksite treatments were not sought out directly by employees, but provided by area employers as an “employee assistance” program, self-selection bias should not be as problematic, compared with developing a covariate model for those who actually sought postdisaster mental health treatment in the community (Boscarino, Adams, et al., 2004). In the latter situation, the study results would likely be heavily biased by patient self-selection to treatment (Hulley et al, 2001.)

Demographic Characteristics. We included five demographic factors as study control variables in our study, including age, education, gender, marital status, and race/ethnicity. Age was coded into four categories, 18-29, 30-44, 45-64, and 65+, with 65+ as the reference category. Education, gender, and marital status were coded as follows: non-college graduate vs. college graduate, male vs. female, and not married vs. married (including living together), with non-college graduate, male, and not married coded as the reference category. Consistent with most population research (Breslau et al., 1998; Ortega, Rosenheck, Alegria, & Desai, 2000), race/ethnicity was self-identified in the following manner. First, the survey interviewer asked the respondent if he/she was of Spanish or Hispanic origin. Next, interviewers queried the respondent about his/her race, which included White, Black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, or “some other race.” Using the responses to these two questions, we classified all respondents as follows: non-Hispanic White, non-Hispanic Black or African American, Hispanic, and Other Race/No Race Given. Non-Hispanic White was the reference category. All of the demographic variables were from the baseline study, unless the data were missing, in which case the follow-up data were substituted.

Stress Exposure, Risk Factors, and Psychological Resources. Our analyses included three stressor variables that may have placed the individual at higher risk for poor mental health and two psychological resources that may have lowered such risk. The baseline survey inquired about 14 pos-

sible events (yes; no) that the respondent could have experienced during the WTC attacks. Since there was not an a priori method of assessing the severity of any of these event exposures, we summed these events into a WTCD exposure scale. We then coded these events into low exposure (0-1 event), moderate exposure (2-3 events), high exposure (4-5 events), and very high exposure (6+ events). Low exposure was the reference category. Second, a traumatic events measure focused on 10 lifetime traumatic events (Freedy, Kilpatrick, & Resnick, 1993), other than the WTCD, which could have happened to the respondent before the WTCD (e.g., forced sexual contact, being attacked with a weapon, having a serious accident, etc.). Respondents were coded into one of four categories, including no lifetime traumas, 1 trauma, 2-3 traumas, and 4 or more traumas, with no traumas coded as the reference category.

The social psychological resource variables were social support (Sherbourne & Stewart, 1991) and self-esteem (Rosenberg, 1979), both of which were collected during the baseline survey. Social support (Cronbach’s alpha = .83) was the sum of four questions about emotional, informational, and instrumental support (e.g., someone available to help you if you were confined to bed.). Based on an examination of the scale’s frequency distribution, we coded respondents into approximately three equal size groups: low, moderate, and high social support. The second resource measure, self-esteem, was measured by the Rosenberg’s self-esteem scale (Rosenberg, 1979). The scale (Cronbach’s alpha = .73) was the sum of five items in the original scale (e.g., I certainly feel useless at times. On the whole, I am satisfied with myself.). The response options were “strongly agree” (coded 1) to “strongly disagree” (coded 4). We coded items so that high scores reflected high self-esteem. The scale had a highly skewed frequency distribution, with over 70% of the respondents having scores between 17 and 20. Therefore, we divided respondents into three categories: low (5-17), moderate (18-19), and high self-esteem (20). For these resource variables, low social support and low self-esteem were the reference categories. These stress/risk and resource measures were used and validated in other WTCD studies in New York City (Boscarino, Adams, et al., 2004; Boscarino, Galea, et al., 2004; Galea et al., 2002).

History of Lifetime Depression. We also included a measure of the lifetime occurrence of one or more episodes of major depression as a control variable to adjust for a history of mental illness. To classify respondents for this diagnosis,

as noted above, we used a version of the SCID's major depressive disorder scale from the non-patients version (Spitzer, Williams, & Gibbon, 1987), which has also been used in telephone-based population surveys (Acierno et al., 2000; Boscarino, Adams, et al., 2004; Boscarino, Figley, et al., 2004; Boscarino, Galea, et al., 2004; Galea et al., 2002; Kilpatrick et al., 2003). Following DSM-IV criteria (APA, 1994), respondents met the criteria for lifetime major depression if they had five or more depression symptoms for at least two-weeks in their lifetimes. As previously noted, the reliability and validity of this scale suggested that it could be used to diagnose depression in the general population (Boscarino, Adams, et al., 2004; Boscarino, Galea, et al., 2004).

Statistical Analyses

Our analytic strategy proceeded in several steps. First, we present descriptive statistics for the sample and for our 7 outcome variables of interest. We next compare the descriptive characteristics for the crisis intervention group ($N = 180$) to the non-intervention group ($N = 1,501$) and then test for statistically significant differences between them. We then describe the characteristics of the crisis intervention services received. Finally, we estimate a series of logistic regression models whereby we regressed each of the 7 outcomes measures of interest separately on the crisis intervention status, demographic, stress/risk, and resource variables discussed. These regression models, thus, assess the impact of brief worksite crisis counseling for the 7 mental health outcomes examined, controlling for selection biases and confounding variables that could obscure these associations (Cohen & Cohen, 1983; Hulley et al., 2001; Neter, Wasserman, & Kutner, 1990). If the baseline crisis intervention sessions were successful, then we would expect to see odds ratios (ORs) less than 1, suggesting that the crisis interventions were protective for the adverse outcomes examined. In addition, given the research literature discussed (Boudreaux & McCabe, 2000; Kaplan et al., 2001), we expected to see a beneficial treatment effect after 1-3 crisis sessions.

For all analyses, we use the survey estimation (svy) command in Stata, version 7 (Stata Corporation, 2001), to generate frequency distributions, point estimates, and our final multivariate regression models. This command set is required for complex surveys and uses the first-order Taylor series linear approximation method (Stata Corporation, 2001). This estimation procedure adjusts the data to take into account our sampling design, which included case weights to adjust

for potentially over-representing persons in households with more telephone lines per adult, the treatment over-sample, and the follow-up survey adjustment. Because of this survey estimation method, the N -values (unweighted) and percentages (weighted) may not be consistent in the tables presented. All p -values presented are based on 2-tail tests.

RESULTS

Descriptive statistics for the study sample are presented in Table 1. First, as can be seen, residents of NYC tend to be fairly educated, with over 40% having a college degree. About 50% were married or living together, and the majority were classified as nonwhite. In terms of our stress/risk measures, overall almost 75% of the respondents reported experiencing 2 or more WTCD related events, almost 70% reported at least one lifetime trauma experience, other than the WTCD, and 19% met criteria for lifetime major depression. These results were comparable to those found in other surveys of the WTCD in NYC (Galea et al., 2002; Vlahov, Galea, Ahern, Resnick, Boscarino, et al., 2004; Vlahov, Galea, Ahern, Resnick, & Kilpatrick, 2004).

In addition, most participants were classified as having moderate to high social support and scored in the moderate to high range on the self-esteem scale, based on the cut points selected for these scales (Boscarino, Adams, et al., 2004). In terms of any difference between the intervention vs. the non-intervention group, only 2 variables examined were statistically significant at the $p < 0.05$ level. These included level of education and WTCD exposure status ($p < 0.001$ for both), whereby the intervention group had higher education and WTCD exposure levels. This makes sense and suggests the companies nearer the disaster site (e.g., Wall Street) were more likely to provide these services for employees.

Overall, 7% (95% confidence interval [C.I.] = 5.6-8.3) of our sample, representing approximately 420,000 New York City adults, reported that they had received some type of brief crisis intervention services at the worksite conducted by a mental health professional following the WTCD (Table 2). Of those who received these sessions, most individuals, about 85%, attended between 1 and 3 sessions. As is common with these interventions (Boudreaux & McCabe, 2000; Kaplan et al., 2001), the content of these sessions covered a range of topics. Between 60% and 70% of the respondents reported that they were instructed about stress symptoms, coping and relaxation techniques, and strategies for how to think positively. The sessions also covered how to stop

Table 1.
Study Population Descriptive Statistics (N = 1,681)

Independent Variables	All Respondents		Intervention Weighted % (Unweighted N) (N = 180)	No Intervention Weighted % (Unweighted N) (N = 1,501)	χ^2 (p-value)
	Weighted % (Unweighted N) (N = 1,681)	95% CI			
Age					
18-29	22.7 (284)	20.1-25.6	24.1 (35)	22.6 (249)	9.48 (0.106)
30-44	32.9 (596)	30.1-35.8	43.2 (83)	32.1 (513)	
45-64	32.5 (586)	29.8-35.4	27.3 (58)	32.9 (528)	
65+	11.9 (215)	10.1-13.9	5.4 (4)	12.4 (211)	
Education					
Non-College Graduate	58.3 (906)	55.4-61.2	36.7 (55)	59.9 (851)	23.88 (<0.001)
College Graduate	41.7 (775)	38.8-44.6	63.3 (125)	40.1 (650)	
Gender					
Male	46.2 (693)	43.2-49.3	37.7 (63)	46.8 (630)	3.60 (0.089)
Female	53.8 (988)	50.7-56.9	62.3 (117)	53.2 (871)	
Marital Status					
Not Married	49.7 (972)	46.7-52.7	48.6 (98)	49.8 (874)	0.06 (0.831)
Married	50.3 (709)	47.3-53.3	51.4 (82)	50.2 (627)	
Race					
White	43.0 (782)	40.1-45.9	45.7 (87)	42.7 (695)	2.28 (0.567)
African American	26.0 (422)	23.4-28.7	20.1 (41)	26.4 (381)	
Latino	24.1 (367)	21.5-26.9	27.0 (37)	23.9 (330)	
Other	7.0 (110)	5.6-8.7	7.2 (15)	7.0 (95)	
Exposure to WTCD					
Low (0-1 events)	26.7 (362)	24.0-29.6	5.8 (9)	28.3 (353)	73.21 (<0.001)
Moderate (2-3 events)	43.9 (719)	40.9-47.0	34.6 (61)	44.6 (658)	
High (4-5 events)	21.8 (416)	19.4-24.4	36.9 (62)	20.7 (354)	
Very High (6+ events)	7.6 (184)	6.3-9.1	22.7 (48)	6.5 (136)	
Lifetime Traumatic Events					
0 events	33.6 (466)	30.7-36.6	24.8 (38)	34.2 (428)	8.59 (0.073)
1 event	23.4 (400)	20.9-26.1	21.9 (41)	23.5 (359)	
2-3 events	26.7 (484)	24.2-29.5	28.6 (52)	26.7 (432)	
4+ events	16.2 (331)	14.2-18.4	24.7 (49)	15.6 (282)	
Lifetime Depression					
No	81.2 (1243)	79.0-83.3	74.3 (123)	81.8 (1120)	3.91 (0.055)
Yes	18.8 (438)	16.7-21.1	25.7 (57)	18.3 (381)	
Social Support					
Low	34.3 (573)	31.4-37.3	24.2 (43)	35.1 (530)	6.05 (0.085)
Moderate	36.9 (636)	34.0-39.9	40.3 (77)	36.7 (559)	
High	28.8 (472)	26.1-31.6	35.6 (60)	28.3 (412)	
Self-Esteem					
Low	32.2 (613)	29.4-35.0	27.3 (49)	32.5 (564)	1.39 (0.562)
Moderate	25.0 (408)	22.4-27.8	27.6 (51)	24.8 (357)	
High	42.9 (660)	39.9-45.9	45.2 (80)	42.7 (580)	

Note: CI = confidence interval

Table 2.
Baseline Crisis Interventions Descriptive Statistics ($N = 1,681$)

Intervention Characteristics	% (Weighted)	95% CI	N (Unweighted)
Number of Brief Crisis Sessions			
None	93.1	91.7-94.4	1501
One	3.8	2.9-5.2	82
Two to Three	2.2	1.7-3.0	68
Four or more	0.8	0.5-1.2	30
Content of Brief Sessions (for those having sessions)			
Educated about Stress Symptoms	71.2	61.1-79.6	137
Talked about Experiences	67.0	56.3-76.2	134
Taught to Cope with Things	69.4	59.8-77.6	127
Taught to Think Positively	64.4	54.7-73.1	116
Taught to Stop Bad Thoughts	45.7	36.1-55.6	81
Taught to Evaluate Thoughts	56.6	46.7-66.1	99
Taught to Deal with Emotions	69.1	59.4-77.3	127
Taught to Relax	68.2	58.6-76.5	127
Reported Helpfulness of Crisis Intervention (for those having sessions)			
Not at All Helpful	22.4	14.1-33.6	31
Helped a Little	33.7	24.5-44.2	57
Helped Some	22.8	16.3-31.0	44
Helped a Lot	21.2	15.0-29.0	48

Note: CI = confidence interval

negative thoughts, how to evaluate thoughts, and how to deal with one's emotions. Lastly, over 80% of the respondents reported that these brief counseling sessions had helped them to deal, at least to some degree, with emotional problems related to the WTCD (Table 2).

The percentages of respondents meeting the diagnostic criteria for the 7 outcomes assessed are shown in Table 3. Almost 15% of the sample met the criteria for binge drinking in the previous 12 months, while about 3% met criteria for alcohol dependence on the GAGE scale during this time period. In terms of the psychological status, 8% met criteria for sub-clinical PTSD and about 12% met criteria for a major depressive episode in the past 12 months. In addition, 11%, 9%, and 9% met the criteria for BSI-18 somatization, anxiety,

and global severity symptoms in the past 30 days, respectively (Table 3).

The logistic regression results presented next show the impact of the baseline crisis interventions on our study outcomes during the follow-up period, 1-year after the baseline study (i.e., 2-years after the attacks), adjusted for potential selection bias and confounding factors (Table 4). As can be seen, in terms of binge drinking ($OR = 0.26, p < 0.05$) and alcohol dependence ($OR = 0.09, p < 0.05$) between 1 and 3 sessions appeared to be effective in protecting workers from these adverse outcomes during the follow-up. Consistent with previous findings (Pfefferbaum & Doughty, 2001; Vlahov, Galea, Ahern, Resnick, Boscarino, et al., 2004), alcohol abusers in our study generally tended to be male and younger.

In terms of PTSD and depression during the follow-up period, it appears that 2-3 sessions were protective for these outcomes, with an OR = 0.36 ($p < 0.05$) and an OR = 0.23 ($p < 0.05$) for PTSD and major depression, respectively. Consistent with previous studies (Boscarino, Adams, et al., 2004; Galea et al., 2002), middle-aged respondents, Latinos, individuals exposed to more WTCD events, those who experienced more lifetime traumas, participants who met criteria for lifetime depression, and individuals with low self-esteem were more likely to experience symptoms consistent with sub-clinical PTSD, compared with older, White, low WTCD exposure, no history of trauma, no history of depression, or higher self-esteem adults. Again consistent with previous findings (Boscarino, Adams, et al., 2004; Galea et al., 2002), depression was associated with being older, Latino, higher exposure to WTCD events, and low self-esteem. As one would expect, lifetime depression was related to depression past year. Interestingly, once other factors were controlled, gender did not predict this outcome.

In terms of the 30-day BSI-18 outcomes for somatization, anxiety, and global severity during the study follow-up period, once again it seemed that 2-3 brief interventions sessions were successful in protecting New York adults from these adverse outcomes, with ORs equal to 0.36 ($p < 0.05$), 0.17 ($p < 0.01$), and 0.30 ($p < 0.05$), respectively. As can be seen, somatization tended to be positively associated with women, African Americans/Latinos, higher WTCD exposures, and lifetime depression, but negatively associated with younger adults and higher levels of social support (Table 4). BSI-18 anxiety tended to be positively associated with adults 45-64, Latinos, higher WTCD exposures, and lifetime depression, but negatively associated with higher education, higher social support, and higher self-esteem (Table 4). Finally, BSI-18 global severity tended to be positively associated with Latinos, higher WTCD exposures, and lifetime depression, but again, negatively associated with younger age, higher education, higher social support, and higher self-esteem (Table 4).

Table 3.
Descriptive Statistics for Follow-up Mental Health Outcomes Assessed ($N = 1,681$)

Follow-up Dependent Variables	% (Weighted)	95% CI	N(Unweighted)
Any Binge Drinking Past Year			
No	85.1	82.7-87.1	1448
Yes	14.9	12.9-17.3	233
Alcohol Dependence Past Year			
No	97.3	96.3-98.1	1625
Yes	2.7	1.9-3.7	56
Sub-clinical (partial) PTSD Past Year			
No	91.9	90.2-93.3	1496
Yes	8.1	6.7-9.8	185
Major Depression Past Year			
No	88.4	86.6-90.1	1404
Yes	11.6	9.9-13.4	277
BSI-18: Somatization Past 30 Days			
No	88.8	86.9-90.4	1432
Yes	11.2	9.6-13.2	249
BSI-18: Anxiety Past 30 Days			
No	90.9	89.2-92.4	1464
Yes	9.1	7.6-10.9	217
BSI-18: Global Severity Past 30 Days			
No	91.3	89.6-92.7	1470
Yes	8.7	7.3-10.4	211

Note: CI = confidence interval

DISCUSSION

Based on our analyses, it appears that worksite crisis interventions provided by many NYC employers following the events of September 11, 2001, had a beneficial impact on the mental status of employees across a spectrum of outcomes. As was seen, these outcomes included a significant reduced risk for binge drinking, alcohol dependence, PTSD symptoms, major depression, somatization, anxiety, and global impairment, compared with comparable individuals who did not receive these interventions. In addition, it appeared that 2-3 brief sessions achieved the maximum benefit for most of the outcomes we examined. The consistency of our results across all the outcomes examined surprised us but we think reinforces the significance of our findings. In addition, we also assessed our results by including the baseline measure for each respective outcome assessed, a very conservative approach, given that our outcomes variables were dichotomous (Hulley et al., 2001). These findings were consistent with the results shown in Table 4.

Thus, the WTC event in New York City seems to have provided an opportunity to evaluate a natural experiment in mental health services delivery. A significant number of NYC employers brought in crisis intervention teams to provide mental health services to employees at the worksite. Our previous research had shown that the majority of adults in NYC did not seek mental health services in the community following the WTC event, even though they may have benefited and these were provided for free by different agencies (Boscarino et al., 2002; Boscarino, Adams, et al., 2004). Our current study suggests, however, that those who did receive brief worksite crisis intervention counseling provided by employers clearly benefited as many as 2 years after the WTC event.

A study limitation, of course, was that our study was not based on random assignment of cases to an intervention vs. a control group (Hulley et al., 2001). Instead, some employers elected to provide crisis interventions for their employees. In addition, the provision of these services was not completely random, as we noted above for education

and WTC exposure levels. We attempted to control for these potential biases, statistically, by inclusion of key demographic, stressor exposure, mental health history, and for social and psychological resource variables as covariates in our logistic regression models. Nevertheless, it is possible that our results may still be biased (Hulley et al.).

Other possible limitations include the fact that we omitted individuals without a telephone and those who did not speak either English or Spanish. Given that the sample matched the 2000 Census for NYC (Adams & Boscarino, 2005), the absence of these households did not appear to have introduced any overall demographic bias. Nevertheless, we are limited in generalizing to other ethnic/language groups in NYC. Another limitation, of course, was that while our mental health measures were based on standardized and validated scales and our treatment exposure variable was based on pre-tested and standardized survey questions, these variables, nevertheless, were based on self-report and therefore may be biased because of recall errors or for other reasons.

Despite these limitations, however, it appears that brief crisis interventions at the worksite following the WTC event were clinically effective up to 2 years after treatment. As we noted, the focus of this study was to examine the effectiveness and safety of brief mental health crisis interventions received by New Yorkers at the worksite following the WTC event. In the current study, approximately 7% of New Yorkers reported receiving brief crisis interventions at the worksite following the WTC event. As indicated, postdisaster crisis interventions have been in use for some time. However, the effectiveness and safety of these crisis interventions have been debated. While we plan to continue our evaluation of these interventions, our current research suggests that these emergency services were highly effective for New Yorkers up to 2 years after the World Trade Center disaster. Based on our current findings, we suggest that crisis intervention services should be considered as a first line of emergency management for those potentially affected by large-scale community disasters.

Table 4.
Multivariate Logistic Regressions for Crisis Intervention Exposures at Baseline Predicting Outcomes at
2-Year follow-up, Controlling for Demographic, Stress/Risk, and Resource Variables.

	Binge Drinking OR (95% CI)	Alcohol Dependence OR (95% CI)	Sub-Clinical (partial) PTSD OR (95% CI)	Major Depression OR (95% CI)	BSI-18 Somatization OR (95% CI)	BSI-18 Anxiety OR (95% CI)	BSI-18 Global Severity OR (95% CL)
Brief Crisis Sessions							
None (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
1 Time	0.42 (0.17-1.03)	0.09 (0.01-0.82)*	0.89 (0.28-2.87)	1.21 (0.36-4.02)	0.45 (0.15-1.28)	0.52 (0.08-3.23)	0.66 (0.10-4.38)
2-3 Times	0.26 (0.08-0.85)*	0.19 (0.02-1.56)	0.36 (0.13-0.98)*	0.23 (0.07-0.71)*	0.36 (0.15-0.88)*	0.17 (0.05-0.61)**	0.30 (0.09-0.99)*
4 or more times	0.61 (0.18-2.05)	0.67 (0.11-4.18)	1.32 (0.46-3.73)	1.32 (0.40-4.42)	1.05 (0.31-3.62)	1.36 (0.38-4.90)	1.51 (0.40-5.67)
Demographic Variables							
Age							
18-29	3.27 (1.57-6.81)**	0.97 (0.24-3.86)	1.06 (0.35-3.21)	1.26 (0.53-3.01)	0.10 (0.04-0.28)***	0.60 (0.20-1.82)	0.24 (0.09-0.66)**
30-44	2.49 (1.24-5.00)*	1.10 (0.31-3.90)	3.52 (1.53-8.09)**	3.34 (1.61-6.93)***	0.52 (0.29-1.03)	2.32 (0.94-5.71)	0.76 (0.35-1.64)
45-64	1.82 (0.91-3.62)	1.19 (0.36-3.92)	2.79 (1.26-6.17)*	2.73 (1.35-5.58)**	1.02 (0.55-1.88)	2.51 (1.04-6.03)*	1.39 (0.68-2.84)
65+ (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Education							
Non-Grad (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
College Graduate	0.84 (0.56-1.25)	1.93 (0.95-3.92)	1.22 (0.74-2.00)	0.85 (0.56-1.29)	0.65 (0.39-1.06)	0.52 (0.33-0.83)**	0.39(0.23-0.66)***
Gender							
Male (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Female	0.29 (0.20-0.43)***	0.32 (0.16-0.63)***	1.38 (0.86-2.22)	0.90 (0.60-1.33)	1.63 (1.03-2.56)*	0.93 (0.58-1.49)	0.61 (0.38-1.00)
Marital Status							
Not Married (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Married	0.93 (0.64-1.35)	0.59 (0.28-1.23)	0.80 (0.50-1.27)	0.93 (0.62-1.39)	0.66 (0.43-1.03)	0.74 (0.45-1.24)	0.70 (0.43-1.16)
Race							
White (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
African American	0.78 (0.47-1.29)	2.54 (1.00-6.45)	1.46 (0.79-2.71)	1.37 (0.82-2.30)	1.77 (1.04-3.08)*	1.16 (0.63-2.11)	1.34 (0.71-2.52)
Latino	1.86 (1.16-2.96)*	5.10 (1.78-14.58)**	2.97 (1.58-5.57)***	2.42 (1.42-4.14)***	3.24 (1.90-5.54)***	3.36 (1.93-5.86)***	4.28 (2.40-7.62)***
Other	0.94 (0.43-2.06)	2.22 (0.43-11.68)	0.74 (0.34-1.60)	0.60 (0.27-1.32)	1.30 (0.55-3.05)	1.62 (0.67-3.91)	2.67 (1.11-6.40)*
Stress/Risk Variables							
Exposure to WTCD							
Low (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Moderate	1.48 (0.90-2.41)	1.09 (0.41-2.89)	1.30 (0.67-2.47)	1.67 (0.96-2.90)	0.85 (0.49-1.46)	0.99 (0.53-1.85)	1.26 (0.69-2.28)
High	1.80 (1.03-3.13)*	1.84 (0.63-5.30)	1.73 (0.85-3.55)	2.08 (1.12-3.88)*	1.02 (0.54-1.94)	1.49 (0.75-2.94)	2.15 (1.07-4.30)*
Very High	1.53 (0.80-2.92)	2.16 (0.66-7.06)	2.86 (1.30-6.29)**	4.28 (2.10-8.70)***	2.34 (1.19-4.61)*	2.57 (1.17-5.64)*	4.17 (1.95-8.92)***
Lifetime Trauma							
0 events (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
1 event	0.97 (0.58-1.62)	1.44 (0.51-4.10)	1.57 (0.74-3.30)	1.05 (0.55-1.98)	0.99 (0.53-1.85)	1.22 (0.64-2.34)	1.01 (0.52-1.94)
2-3 events	1.24 (0.76-2.03)	2.28 (0.76-6.85)	2.87 (1.50-5.51)**	1.60 (0.95-2.69)	1.67 (0.94-2.96)	1.68 (0.90-3.14)	0.97 (0.52-1.81)
4+ events	1.34 (0.79-2.28)	2.82 (0.96-8.26)	3.28 (1.64-6.58)***	1.64 (0.93-2.90)	1.28 (0.69-2.37)	1.42 (0.70-2.90)	0.97 (0.47-2.00)
Lifetime Depression							
No (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Yes	1.06 (0.69-1.63)	1.61 (0.73-3.54)	2.63 (1.64-4.25)***	3.72 (2.45-5.67)***	2.36 (1.50-3.70)***	3.12 (1.92-5.09)***	3.77 (2.28-6.23)***
Resource Variables							
Social Support							
Low (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Moderate	0.98 (0.64-1.52)	1.47 (0.63-3.46)	0.83 (0.51-1.35)	0.77 (0.50-1.20)	0.58 (0.37-0.89)*	0.49 (0.30-0.81)**	0.39 (0.24-0.62)***
High	0.76 (0.48-1.23)	3.26 (1.29-8.25)*	0.50 (0.25-0.97)*	0.71 (0.43-1.19)	0.53 (0.30-0.95)*	0.42 (0.23-0.78)**	0.54 (0.29-1.00)
Self-Esteem							
Low (Ref)	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —	1.00 —
Moderate	0.58 (0.35-0.94)*	0.60 (0.24-1.52)	0.69 (0.39-1.22)	0.34 (0.21-0.56)***	0.83 (0.50-1.38)	0.43 (0.24-0.76)**	0.45 (0.26-0.77)**
High	0.74 (0.47-1.15)	0.61 (0.25-1.45)	0.42 (0.23-0.74)**	0.26 (0.16-0.43)***	0.36 (0.22-0.60)	0.20 (0.11-0.38)***	0.17 (0.09-0.33)***

NOTE: *p <.05 **p <.01 ***p <.001. OR = odds ration, CI = confidence interval, Ref = reference group.

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