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Manhattan, New York City**



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Research

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ABSTRACT: To assess mental health utilization in Manhattan following the September 11th terrorist attacks, a random-digit-dial telephone survey was conducted 5 to 8 weeks afterwards, among 988 randomly selected adult householders over 17 years old (females = 52%; whites = 72%; mean age = 42). 16.9% (95% confidence interval [CI]=14.4-19.5) of residents reported using mental health services 30 days before the attacks and 19.4% (95% CI=16.7-22.2) reported using these services 30 days afterwards (pre/post McNemar's $\chi^2 = 8.0$, $df=1$, $p=0.005$, odds ratio[OR] =2.0). 10.0% (95% CI=7.9-12.0) increased mental health utilization 30 days after the attacks, compared to 30 days before and 5.3% (95% CI=3.7-6.9) decreased utilization. Risk factors associated with increased mental health utilization in multivariate analyses included: being 45-64 years of age (vs. 65+; OR = 8.3, $p=0.011$) female gender (OR=2.3, $p=0.004$), experiencing 4+ lifetime traumatic events (vs. none; OR=3.5, $p=0.002$), experiencing 2+ stressful life events in the past 12 months (vs. none; OR=3.3, $p<0.001$), and experiencing an acute panic attack during the disaster (OR=3.3, $p<0.001$). Neither current post-traumatic stress disorder (PTSD) nor current depression was predictive of increased post-disaster utilization when panic attack was included in the multivariate analysis. While we did find a statistically significant increase in pre- vs. post-disaster utilization among the general population in Manhattan this increase was not substantial, except among specific subgroups, including those who had a peri-event panic attack, among those exposed to previous stressors, among women, and among those less than 65 years old. [International Journal of Emergency Mental Health, 2002 4(3),pp 143-155].

KEY WORDS: Posttraumatic Stress Disorder, PTSD, depression, panic disorder, disasters, service utilization, mental health services.

Introduction

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Previous post-disaster studies suggest that survivors of major disasters develop psychiatric disorders after these events, including posttraumatic stress disorder (PTSD), depression, anxiety, panic, and other mental disorders (Green, 1991; Norris, 1992; Smith et al., 1990). The terrorist attack in New York City (NYC) on September 11th, 2001, resulted in one of the largest death tolls of any disaster in the United States (US) (The New York Times, 2001). In addition, a large area of lower Manhattan was destroyed and significant socioeconomic disruptions have occurred (Barry, 2001; The Wall Street Journal, 2001). While major disasters are relatively rare, lasting effects are generally seen in a wide range of disasters, and especially among those involving significant

loss of life (Rubonis & Bickman, 1991). An initial study of the acute psychological effects after the September 11th attacks reported a high prevalence PTSD and depression in Manhattan—7.5% of adults had current PTSD related to the attacks and 9.7% had current depression (Galea et al., 2002).

Although utilization of mental health services has been documented following disasters (Carr, Lewin, Carter, & Webster, 1992; Smith, Christiansen, Vincent, & Hann, 1999), few investigations have focused on population level post-disaster mental health utilization. Much of the disaster research has focused on the impact among direct survivors, and different utilization measures and time frames have made generalization difficult (Burkle, 1996; Gleser, Green, & Winget, 1981; Joseph et al., 1993; Madakasira & O'Brien, 1987). Also, persons in the same community may be differentially affected by the same disaster, due to level of disaster exposure, relationships with victims, socioeconomic disruptions, and other exposure-related events. For more effective public health planning, better assessment and prediction of a population's post-disaster mental health service utilization is needed.

To estimate prevalence and correlates of mental health service use in NYC after the attacks, we conducted a random-digit-dial telephone survey of Manhattan residents living below 110th Street five to eight weeks after September 11th. We restricted the survey to below 110th because we wanted to conduct a rapid assessment of the area we thought most directly effected by the attacks. In addition, we scheduled a second survey to assess the rest of New York City, including the area of Manhattan north of 110th Street (Galea, Boscarino, Resnick, & Vlahov, 2002). We had three a priori hypotheses: (i) there would be an increase in mental health service use after the attacks, (ii) increased utilization would co-occur with an increase in PTSD and depression after the attacks, and (iii) there would be an association between event-exposure and increased service use.

Materials and Methods

Participants

All English or Spanish-speaking adults (over 17 years old) who were living on Manhattan south of 110th street in households with telephones at the time of the study were potential study participants. The sample was selected using random-digit dialing of telephone numbers. When we reached

a person at a residential telephone number, we obtained verbal consent and then determined the area of residence in Manhattan, screening out households north of 110th Street. The number of adults in each household was determined and one adult per household was randomly selected for an interview. Sampling weights were developed and applied to our data to correct potential selection bias related to the number of household telephones and number of persons in the household. Based on standard survey research estimation methods, the cooperation rate for the survey was estimated to be 64.3% (American Association for Public Opinion Research, 2000).

Data collection

Interviews were conducted by experienced interviewers using a computer-assisted telephone interviewing system. Both English and Spanish language versions of the questionnaire were used. A protocol was in place to provide assistance to participants who required mental health counseling. Mean duration of the interviews was 35 minutes. The Institutional Review Board of the New York Academy of Medicine reviewed and approved the study protocols.

During the survey, we asked about participants' lifetime mental health service utilization and also about mental health utilization for the 30 days before September 11th and in the 30 days after September 11th. Specifically, we asked if participants sought help for any personal or emotional problems during these timeframes from a helping professional, like a counselor, physician, or self-help group. In addition, we asked about types of mental health professionals they visited, including psychiatrists, other physicians, psychologists, counselors, social workers, the clergy, or other health professionals.

We asked questions about demographic variables including age, race/ethnicity, gender, yearly household income, education, and marital status. We collected information regarding the intersections closest to two addresses: where the respondent was living prior to September 11th, and where the respondent was upon learning about the September 11th attacks.

We asked if respondents had emotional, instrumental, and appraisal social support available to them in the six months before the events of September 11th (Sherbourne & Stewart, 1991). For the analyses, total social support was divided into tertiles representing "low," "medium," and "high" social support. We asked about lifetime exposure to traumatic

events (Stamm, 1996). For the analyses, we divided these into groups of 0, 1, 2-3, or 4+ lifetime traumatic events. We asked about a list of 8 stressful life events (e.g., having a spouse die) that a person could have experienced in the year before the events of September 11th (Freedy, Kilpatrick, & Resnick, 1993). For the analyses, we divided these responses into groups of 0, 1, or 2+ stressful life events in the past year.

We assessed a number of specific event-experiences including: if the respondent had directly witnessed the attacks, was afraid for her/his life, had friends or relatives killed, was displaced from her/his home, was involved in the rescue efforts, or lost her/his job or possessions as a result of the attacks. We also asked questions regarding type, and quantity of media exposure, including questions about how many times each of five specific images were seen on television in the 7 days after September 11th. For the analyses we created tertile categories based on the sum of the images viewed.

We used three measures of mental health status in our study: peri-event panic attack, PTSD, and depression. The panic attack measure was a modified version of the Diagnostic Interview Schedule (DIS) measure for panic attack (Centers for Disease Control, 1989), phrased to assess peri-event symptoms that occurred during or shortly following the terrorist attacks. We asked about panic symptomatology specifically in the first few hours after the events of September 11th — the presence of at least four or more symptoms contributed to a diagnosis of a peri-event panic attack (American Psychiatric Association, 1995). The PTSD measure was a modified version of the DIS PTSD measure, which was used in the National Women's Study and modified based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1995; Kilpatrick et al., 1998). This PTSD scale uses a nonevent-specific approach for the assessment of PTSD (Kilpatrick et al., 1998). When the respondent reported a particular symptom for at least a 2-week duration, additional questions assessed how recent this was and the content of the symptom. Current PTSD was based on presence of diagnostic criteria within the previous 30 days. The PTSD scale used had a Kappa coefficient of agreement with the clinician-administered, Structured Clinical Interviews for DSM-III-R (SCID) of 0.71 for current PTSD (Kilpatrick et al., 1998; Spitzer, Williams, & Gibbon, 1987). Current PTSD for the analyses presented was based on the prevalence of the necessary PTSD criterion B, C, and D symptoms within the previous 30 days. For this study, the re-experiencing symptoms (criterion B), the

avoidance symptoms (criterion C), and the arousal symptoms (criterion D) were not required to be related to the September 11th attacks to qualify as current PTSD symptoms. Participants were required to report at least 1 re-experiencing symptom, 3 avoidance symptoms, and 2 arousal symptoms in the previous 30 days. The Cronbach alpha coefficient for the symptoms used in this scale, a measure of internal consistency (Cattell, 1986), was 0.90. For the presence of current depression in the past 30 days, we used an adapted version of the SCID's major depressive episode interview (Spitzer, Williams, & Gibbon, 1987). The Cronbach alpha coefficient for the symptoms used in this scale was 0.79.

Statistical analyses

We report mental health visits to different professionals for lifetime, as well as for 30 days before and 30 days after the September 11th attacks. We used a pre/post McNemar's chi² test to assess a change in mental health visits in the 30 days before vs. the 30 days after the attacks. We also report increases in mental health visits 30 days after the September 11th attacks, calculated as an increase of one or more visits compared to the month before the attacks (i.e., total visits 30 days before - total visits 30 days after = percent with increased visits). Point estimates and two-tailed 95% confidence intervals (CIs) are given for all data. The unadjusted (crude) odds ratios (ORs) and 95% confidence intervals were calculated for all bivariate associations. Investigators in previous studies have reported that both demographic and event-exposure factors are associated with adverse psychological outcomes, including PTSD, depression, and other disorders following traumatic exposures (Bromet, Sonnega, & Kessler, 1998; Kessler et al., 1994; Kulka et al., 1990). As noted, reports of increased mental health utilization following disasters also have been documented (Carr, Lewin, Carter, & Webster, 1992; Gleser, Green, & Winget, 1981; Smith, Christiansen, Vincent, & Hann, 1999). Following this research, we identified demographic and exposure variables potentially associated with post-disaster mental health utilization and included these in bivariate analyses. Multivariate logistic regression was then used to examine these associations in a predictive model. This model predicted an increase in mental health visits in the 30-days post-disaster (compared to 30-days pre-disaster). Variables with overall $p < 0.1$ in our initial bivariate analyses were selected for this multivariate model, permitting multivariable assessment. We also tested for 2-

way interaction effects between age, education, marital status, and race in this predictive model, because some of these subgroups have been associated with different mental health utilization rates (Hunt, 1995). Our predictive multivariate model also was assessed for goodness-of-fit, using the Hosmer-Lemeshow test and the receiver operating characteristic (ROC) statistic (Hosmer & Lemeshow, 2000). We used the survey estimation (svy) command set in Stata, version 7 (Stata Corporation, 2001), to generate all point estimates, p-values, CIs, and our logistic regression model. This was needed to adjust the data for our sampling design, which included case weights to correct for potentially over-representing persons in households with more telephone lines per adult.

Results

Among 1,008 adults surveyed, 20 were excluded from analysis due to missing weighting variables. Overall, 52.0% percent of the sample were women; mean age was 42 years (standard deviation=15.4 years) and 71.6% were white. Age, gender, race, and residence distributions in our sample were comparable to estimates obtained by the 2000 US Census for our sampling frame (Bureau of the Census, 2000).

In the overall sample, 8.8% (95% CI=6.7-10.8) and 9.7% (95% CI=7.7-11.8) of adult residents, respectively, were classified as having current PTSD or current depression (Table 1). Nineteen point four percent (19.4%) (95% CI=16.7-22.2) of residents had professional visits for mental health problems 30 days after the disaster, while 16.9% (95% CI=14.4-

19.5) had professional visits 30 days before the disaster. A pre/post McNemar test for this change was significant (McNemar's $\chi^2 = 8.0$, $df=1$, $p=0.005$, odds ratio[OR]=2.0). Compared to 30-days before, 10.0% (95% CI=7.9-12.0) of residents had an increase of one or more mental health visits in the 30 days after the disaster, compared to 30 days before (Table 1). During this same time frame, it is noted, 5.3% (95% CI=3.7-6.8) had a decrease in mental health visits (not shown in Table 1).

Overall, we found 39.8% (95% CI=36.5-43.2) of Manhattan residents reported visiting mental health professionals in their lifetimes for emotional or personal problems (Table 2). Specifically, 21.9% had visited psychologists, 18.9% psychiatrists, 13.5% other physicians, and 10.6% had visited mental health counselors for these problems (Table 2). In the 30 days before and 30 days after the disaster, the professionals most often seen for mental health problems included psychologists (6.9% and 7.5%, respectively), psychiatrists (5.7% and 6.5%, respectively), other physicians (3.6% and 4.8%, respectively), social workers (both 3.2%), and mental health counselors (2.3% and 3.0%, respectively) (Table 2).

Table 3a shows the associations between increased post-disaster mental health utilization and demographic variables. Increased mental health utilization was associated with: age groups 18-24, 25-44, and 45-64 (vs. 65+; OR=6.6, $p=0.027$, OR=7.2, $p=0.007$, and OR=10.0, $p=0.002$, respectively), female gender (vs. male; OR=2.5, $p<0.001$), and living as an unmarried couple (vs. married; OR=2.4, $p=0.029$). Among the exposure variables (Table 3b), increased utilization was associated with experiencing 1 or more lifetime traumatic events (vs. none;

Table 1 Posttraumatic Stress Disorder (PTSD), Depression, and Mental Health Visits Among Manhattan Residents after September 11th Attacks (N = 988)*

Main Outcomes	30 Days After Attacks		
	n [†]	%	95% CI
Current PTSD	88	8.8	6.7-10.8
Current Depression	95	9.7	7.7-11.8
Mental Health Visits	192	19.4	16.7-22.2
Increased Visits	98	10.0	7.9-12.0

[†] All Ns shown are weighted results derived from the application of sampling weights used to adjust the obtained sample for the number of telephone lines and adults in the household.* PTSD = Post-traumatic Stress Disorder; CI = confidence interval.

Table 2 Reported Mental Health Specialists visited in Lifetime, 30 Days before and 30 Days after September 11th Attacks among Manhattan Residents (N = 988)*

Mental Health Specialists Seen	% Lifetime [†]			30 Days Before Attacks			30 Days After Attacks		
	n [‡]	%	95% CI	n	%	95% CI	n	%	95% CI
Psychologist	217	21.9	19.1-24.8	68	6.9	5.2- 8.7	74	7.5	5.7- 9.3
Psychiatrist	186	18.9	16.2-21.5	56	5.7	4.2- 7.2	65	6.5	5.0- 8.2
Other Physician	133	13.5	11.1-15.8	35	3.6	2.3- 4.8	47	4.8	3.4- 6.2
Mental Health Counselor	105	10.6	8.4-12.7	22	2.3	1.2- 3.3	30	3.0	1.8- 4.2
Social Worker	89	9.0	7.1-10.9	32	3.2	2.0- 4.4	31	3.2	2.1- 4.3
Minister, Priest, Rabbi, etc.	49	5.0	3.5- 6.5	13	1.4	0.5- 2.3	23	2.3	1.2- 3.4
Other	24	2.4	1.4- 3.5	8	0.8	0.2- 1.4	9	0.9	0.3- 1.6
Total Any Specialists	394	39.8	36.5-43.2	168	16.9	14.4-19.5	192	19.4	16.7-22.2
Total N	988			988			988		

* CI= Confidence interval.

[†] Lifetime results shown are for 39.8% of residents (95% CI=36.5-43.2) who have ever visited mental health professionals in their lifetimes (n=394).[‡] All Ns shown are the weighted results from the application of sampling weights used to adjust the sample for the number of telephone lines and adults in the household.

Table 3a Association between Post-Attack increase in Mental Health Visits and Demographic Factors*

Demographic Factors	Post-Attack Increase in Mental Health Visits					
	n [†]	Total %	% with Increase	OR	95% CI	P Value
Total N	988	100.0				
Age						
18-24	92	9.4	8.7	6.6	1.2-34.8	0.027
25-44	498	50.4	9.9	7.2	1.7-30.2	0.007
45-64	293	29.7	13.4	10.0	2.4-43.1	0.002
65+ (Ref.)	88	9.0	1.1	1.0	-	-
Gender						
Male (Ref.)	474	48.0	5.9	1.0	-	-
Female	514	52.0	13.7	2.5	1.5- 4.1	<0.001
Race						
White (Ref.)	683	69.1	10.6	1.0	-	-
African American	51	5.1	8.0	0.7	0.2- 2.3	0.60
Hispanic	136	13.8	8.8	0.8	0.4- 1.8	0.61
Asian	70	7.1	5.7	0.5	0.2- 1.7	0.30
Other	49	4.9	12.2	1.1	0.5- 2.7	0.81
Income						
\$100,000 and over (Ref.)	319	32.3	10.7	1.0	-	-
\$75,000 - \$99,999	92	9.3	6.5	0.6	0.2- 1.4	0.21
\$40,000 - \$74,999	168	17.0	16.3	1.6	0.9- 3.0	0.12
\$20,000 - \$39,999	140	14.1	7.9	0.7	0.3- 1.6	0.43
Less than \$20,000	102	10.4	8.8	0.8	0.3- 1.9	0.61
Income not Available	167	16.9	6.0	0.5	0.2- 1.2	0.124
Education						
Less than Grad. Degree (Ref.)	253	25.7	9.5	1.0	-	-
College Degree	440	44.6	8.9	0.9	0.5- 1.8	0.84
Graduate Degree	290	29.3	12.1	1.3	0.7- 2.5	0.40
Marital Status						
Married (Ref.)	351	35.5	8.0	1.0	-	-
Divorced, Sep., widowed	139	14.1	14.3	1.9	1.0- 3.7	0.061
Never Married	415	42.0	8.7	1.1	0.6- 2.0	0.77
Unmarried Couple	76	7.7	17.1	2.4	1.1- 5.3	0.029
Health Insurance Coverage						
No (Ref.)	117	11.9	8.5	1.0	-	-
Yes	868	87.9	10.2	1.2	0.5- 2.6	0.65
Social Support						
Low (Ref.)	349	35.3	12.4	1.0	-	-
Medium	272	27.6	7.4	0.6	0.3- 1.0	0.054
High	324	32.8	9.3	0.7	0.4- 1.3	0.25

* CI = Confidence interval; OR = Odds ratio; Ref = Reference group.

† All Ns shown are the weighted results from the application of sampling weights used to adjust the sample for the number of telephone lines and adults in the household.

Table 3b Association between Post-Attack increase in Mental Health Visits and Exposure-Related Factors*

Exposure Factors	n [†]	Post-Attack Increase in Mental Health Visits				
		Total %	% with Increase	OR	95% CI	P Value
Total	988	100.0				
Alcohol Consumption Post Disaster						
No increase (Ref)	681	75.3	8.9	1.0	-	-
Increased	223	24.7	12.6	1.5	0.9-2.4	0.112
Media Expose Post Disaster						
Low (Ref.)	325	32.9	7.7	1.0	-	-
Medium	314	31.8	9.3	1.2	0.7-2.3	0.51
High	332	33.6	11.8	1.6	0.9-2.9	0.102
Lifetime Traumatic Stress Events						
None (Ref.)	277	28.0	4.0	1.0	-	-
1 Event	211	21.3	9.5	2.5	1.1-5.8	0.033
2-3 Events	293	29.6	11.0	2.8	1.4-5.9	0.005
4 or more Events	208	21.0	16.9	4.7	2.2-9.8	> 0.001
Stressful Events Past 12 Months						
None (Ref.)	563	57.0	5.7	1.0	-	-
1 Event	254	25.7	11.4	2.1	1.2-3.8	0.015
2 or more Events	171	17.3	21.9	4.6	2.6-8.2	> 0.001
Involvement in Rescue Operations						
None (Ref.)	392	39.7	5.9	1.0	-	-
Some	482	48.8	12.7	2.3	1.3-4.1	0.003
Significant †	114	11.6	13.3	2.4	1.2-5.0	0.015
Lived Below 14 th Street						
No (Ref.)	738	74.7	9.7	1.0	-	-
Yes	250	25.3	10.8	1.2	0.7-2.0	0.60
Lost Job or Work Reduced						
No (Ref.)	875	88.5	9.6	1.0	-	-
Yes	113	11.5	12.6	1.4	0.7-2.7	0.33
Displaced after Disaster						
No (Ref.)	924	93.5	9.8	1.0	-	-
Yes	64	6.5	12.5	1.3	0.5-3.0	0.61
Believed could be Killed						
No (Ref.)	820	83.0	9.1	1.0	-	-
Yes	154	15.6	13.0	1.5	0.8-2.5	0.18
Relative or Close Friend Killed						
No (Ref.)	878	88.9	8.7	1.0	-	-
Yes	110	11.1	20.0	2.7	1.5-5.0	0.002
Witnessed Disaster						
No (Ref.)	606	61.3	8.1	1.0	-	-
Yes	374	37.9	12.3	1.6	1.0-2.6	0.053
Panic Attack during Disaster						
No (Ref.)	864	87.4	7.5	1.0	-	-
Yes	124	12.6	26.8	4.5	2.6-7.7	> 0.001
Current Depression						
No (Ref.)	874	88.5	8.3	1.0	-	-
Yes	94	9.5	25.5	3.8	2.1-6.8	< 0.001
Current PTSD						
No (Ref.)	901	91.2	8.4	1.0	-	-
Yes	87	8.8	26.4	4.0	2.3-7.0	< 0.001

* CI = Confidence interval; OR = Odds ratio; Ref = Reference group.
† All Ns shown are the weighted results from the application of sampling weights used to adjust the sample for the number of telephone lines and adults in the household.
‡ Indicates direct involvement with rescue efforts.

OR=2.5, $p=0.033$ for 1 event, OR=2.8, $p=0.005$ for 2-3 events, and OR=4.7, $p<0.001$ for 4+ events, respectively), experiencing one or more stressful life events in the past 12 months (vs. none; OR=2.1, $p=0.015$ for 1 event and OR=4.6, $p<0.001$ for 2+ events, respectively), and involvement in the rescue operations (vs. none; OR=2.3, $p=0.003$ for some involvement and OR=2.4, $p=0.015$ for significant involvement, respectively). In addition, utilization also was associated with having had a close friend or relative killed in the disaster (vs. not; OR=2.7, $p=0.002$), having a panic attack during the disaster (vs. not; OR=4.5, $p<0.001$), having current depression (vs. not; OR=3.8, $p<0.001$), and having had current PTSD (vs. not; OR=4.0, $p<0.001$).

All variables in the bivariate analyses with overall p -values <0.10 were included in the multivariate analysis, except current PTSD and depression (Table 4). The reason for this was that both of these variables were strongly associated (49% of those with current PTSD also had current depression). In addition, current PTSD also was associated with having had a panic attack (47% of those with current PTSD also had a panic attack). Consequently, we excluded PTSD and depression from our main multivariate model and discuss results using these variables separately below.

Among the variables included, those associated with an increase in post-disaster visits included: age groups 18-24, 25-44, and 45-64 (vs. age 65+; OR=6.8, $p=0.047$, OR=5.6, $p=0.046$, and OR=8.3, $p=0.011$, respectively), female gender (vs. male; OR=2.3, $p=0.004$), household incomes of \$75,000-\$99,000 (vs. \$100,000+; OR=0.3, $p=0.027$), a lifetime history of 1 and 4+ traumatic events (vs. none; OR=2.5, $p=0.045$, OR=3.5, $p=0.002$, respectively), experiencing 1 and 2+ stressful life events in the past 12 months (vs. none; OR=1.9, $p=0.016$, OR=3.3, $p<0.001$, respectively), having some involvement in the rescue operations (vs. none; OR=2.2, $p=0.01$), and having experienced a panic attack (vs. not; OR=3.3, $p<0.001$).

Assessment of goodness-of-fit for this model indicated that it was acceptable, with the Hosmer-Lemeshow test $p=0.38$ and a ROC statistic = 0.80 (Hosmer & Lemeshow, 2000). We also evaluated interaction effects between age, gender, marital status, and educational level, because we thought these variables could interact with the exposure variables, but none of these were significant.

We conducted additional multivariate analyses in which both PTSD and depression were included in the final model predicting increased post-disaster service utilization (i.e., all variables in Table 4, plus PTSD and depression). We did not

find these variables to be significant in this model, regardless of whether they were included together or separately. However, when panic was removed and separate models were run for PTSD and depression, respectively, each of these variables was moderately significant in the model (OR=2.2, $p<0.025$ for both, respectively). We also tested for interaction effects for PTSD x depression and for PTSD x panic, but these were not found to be significant in the model that also included these plus the respective main effects.

Discussion

Our data suggest that 19.4% of Manhattan residents living below 110th Street (95% CI=16.7-22.2) saw a mental health professional for mental health problems within 30 days after the World Trade Center Disaster, a statistically significant increase from 30-days pre-disaster, based on a pre/post McNemar test. Overall, 10% (95% CI=7.9-12.0) of residents increased their mental health visits during this period, compared with the month before the disaster. Mental health professionals most often seen in the post-disaster period were psychologists (7.5%), psychiatrists (6.5%), and other physicians (4.8%). Factors associated with increased post-disaster visits in our multivariate model were being in the 18-24, 25-44 and the 45-64 age groups, being female, experiencing other lifetime traumatic events, experiencing stressful life events in the past 12 months, having some involvement with the rescue operation, such as making donations, (but not significant involvement, such as working at the disaster site), and having a panic attack during the disaster.

Although the lifetime mental health utilization rates in our study of 39.8% seem somewhat high, since national research suggests that this figure is about 28% in the US (Kessler et al, 1994), we think this finding is not unreasonable given the ethnicity, education level, and income level of the area surveyed. What was surprising, however, was that mental health utilization was not substantially higher among Manhattan residents 30 days after September 11th, compared with the 30 days before. The most likely reason for this finding may be related to the short post-disaster timeframe in this study; 30 days may not have been sufficient time to assess population level changes in Manhattan, especially given the level of disruption in the city at the time. Because of this, the gap between seeking help and actually receiving it may be wider than normally found. Also surprising was that only 4.8% of residents sought care from another (non-psychiatric)

Table 4 Multivariable Model Predicting Increased Mental Health Utilization in Manhattan Post Attacks (N=988)*

Demographic & Exposure Factors	Increased Visits Post-Attack		
	OR	95% CI	P Value
Age			
18-24	6.8	1.0-44.7	0.047
25-44	5.6	1.0-30.1	0.046
45-64	8.3	1.6-42.8	0.011
65+ (Ref.)	1.0	-	-
Gender			
Male	1.0	-	-
Female	2.3	1.3-3.9	0.004
Income			
\$100,000 and over (Ref.)	1.0	-	-
\$75,000 - \$99,999	0.3	0.1-0.9	0.027
\$40,00 - \$74,999	1.0	0.5-2.1	0.92
\$20,000 - \$39,999	0.7	0.3-1.7	0.41
\$19,999 or less	0.5	0.2-1.1	0.093
Not available	0.7	0.3-1.5	0.32
Marital Status			
Married (Ref.)	1.0	-	-
Divorced, Separated, Widowed	2.2	1.0-4.8	0.053
Never Married	1.0	0.5-2.2	0.90
Unmarried Couple	2.1	0.9-4.9	0.083
Lifetime Traumatic Stress Events			
None (Ref.)	1.0	-	-
1 Event	2.5	1.0-6.1	0.045
2-3 Events	2.1	1.0-4.6	0.059
4 or more Events	3.5	1.6-8.0	0.002
Stressful Life Events Past 12 months			
None (Ref.)	1.0	-	-
1 Event	1.9	1.1-3.3	0.016
2 or more Events	3.3	1.8-6.1	<0.001
Involvement in Rescue Operations			
None (Ref.)	1.0	-	-
Some	2.2	1.2-3.9	0.01
Significant †	1.2	0.5-2.5	0.72
Relative or Close Friend Killed			
No (Ref.)	1.0	-	-
Yes	1.7	0.8-3.5	0.13
Witnessed Disaster			
No (Ref.)	1.0	-	-
Yes	1.7	1.0-2.7	0.052
Panic Attack During Disaster			
No (Ref.)	1.0	-	-
Yes	3.3	1.8-6.1	<0.001

* CI = Confidence interval; OR = Odds ratio; Ref = Reference group. † Indicates direct involvement with the rescue operations.

physician for mental health problems and only 6.5% sought this care from a psychiatrist within the 30-day post-disaster period. We thought these figures would be higher.

Among direct survivors of the Oklahoma City bombing, as many as 41% were reported to have sought professional mental health treatment within 6 months post disaster (North et al., 1999). However, among the general population within the Oklahoma City metropolitan area, only 8.5% sought help 3-months post disaster (Smith, Christiansen, Vincent, & Hann, 1999). This is fewer than half as many people who saw mental health professionals in our Manhattan study, however the absence of a pre-event utilization estimate in Oklahoma City makes comparison difficult. Six months following the Newcastle earthquake in Australia, a community survey indicated that as many as 21.3% of adults used disaster-related support services, but these apparently included services other than mental health services (Carr, Lewin, Carter, & Webster, 1992). As these few studies suggest, due to different exposure factors, timeframes, demographic factors, and regional differences, it is difficult to predict population-level mental health utilization, except that it will usually be higher than it was before the disaster (Burkle, 1996; Gleser, Green, & Winget, 1981). Complicating the lack of comparability in mental health assessment is the fact that many post-disaster studies tend to focus on emergency service utilization (Burkle, 1996; Gerrity & Flynn, 1997).

In our final multivariate model, experiencing a peri-event panic attack was independently associated with increased mental health utilization (OR=3.3, $p<0.001$). Previous work has shown that acute emotional responses are associated with the development of PTSD and depression after disaster (Harvey & Bryant, 1999). The significance of this association coupled with the lack of a consistent association between other event-exposure variables suggests that peri-event physiological reactions and corresponding psychological perceptions of physiological responses may be important factors in determining both subsequent psychopathology and mental health utilization. Further longitudinal research should explore the role that the peri-event panic attack plays in predicting longer-term mental health utilization and psychopathology.

As noted, other significant independent variables in our multivariate model included exposure to 4+ lifetime traumatic events, exposure to 2+ stressful life events in the past 12 months, being female, being less than 65 years old, being in the \$75,000 to \$99,999 income category (which is protective),

and having some, but not extensive, involvement with the rescue operations. The reason why those in the \$75,000 to \$99,999 category (vs. \$100,000+ income category) have a reduced likelihood of mental health visits is unclear. Perhaps this is because of variation due to the limited cell size of this particular category ($n=92$). Previous research has documented that PTSD was associated with history of traumatic stress exposures, as well as exposure to stressful life events (Freedy, Kilpatrick, & Resnick, 1993). Also, women often were found to be at higher risk for PTSD (Breslau et al., 1998; Kessler et al, 1995) and were typically higher users of medical and mental health services (Hunt, 1995). Younger age, especially being less than 65 years old, also has been found to be a risk factor for post-disaster onset of PTSD (Madakasira & O'Brien, 1987; Shore, Vollmer, & Tatum, 1989). The association found for level of rescue involvement, whereby compared to those with no involvement, those with some involvement (e.g., they made donations) had increased post-disaster utilization, rather than those with direct involvement (e.g., they worked at the disaster site or counseled victims) is interesting and could mean several things. One is that those with direct involvement may have had access to more extensive social support systems and, thus, may have had less need for mental health services (Boscarino, 1995). Another is that, given their level of direct involvement, these individuals may have had experienced a delayed stress response. Consequently, they may experience more serious symptoms and higher utilization later, since this group is generally considered to be at a higher risk for these outcomes (Fullerton, McCarroll, Ursano, & Wright, 1992). We cross-tabulated reported social support level (i.e., low, medium, and high) with level of reported rescue involvement (i.e., none, some, and significant) and there appeared to be some evidence for the "social support" hypothesis (chi-square = 14.1, $df=4$, $p=0.023$, Gamma = 0.16). We plan additional research to evaluate this in the future.

As noted, adding current PTSD and depression to the full multivariate model added little explanatory value. Both of these variables were not significant in this "saturated" model with panic also included. The reason for this is unclear. As noted, current PTSD and depression were strongly associated, as were current PTSD and panic, but panic attack dominated as a predictor of utilization in the multivariate model. Nevertheless, even though PTSD and depression are not significant in the full model, they were correlated with mental health utilization in the post-disaster period. For example, 44.9% (95% CI=34.1-56.2) and 44.3% (95% CI=33.8-

55.4) of current PTSD and current depression cases, respectively, had at least one mental health visits in the 30-day post-disaster period. In addition, *increased* post-disaster mental health utilization was about 26% for both PTSD and depression cases, respectively, similar to the figure found for peri-event panic attack (see Table 3b).

The observations we draw from this study must be interpreted with caution. At the time of the study residents of NYC were on heightened state of alert, with discovery of anthrax attacks in the city and concern about possible further terrorist attacks. Additional concerns have been raised about potential exposure to toxic chemicals and debris. These factors may have reduced service utilization. We collected data using a household telephone interview, raising the possibility of biased reporting and/or sample selection. We also should note that the population of Manhattan below

110th Street largely is white, affluent, and well educated. It may be difficult to generalize these results to more socio-demographically diverse groups. Finally, while the 30-day pre/post McNemar test was statistically significant, the overall population increase was relatively modest (e.g., 19.4% - 16.9% = 2.5%). Future research after September 11th needs to explore changes in mental health utilization in the medium-term after these events, as well as the relation between mental health utilization, event-exposures, psychopathology, and other factors in more detail among a wider population.

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