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Mental health service use 1-year after the World Trade Center disaster: implications for mental health care☆

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Abstract

The objective of this study was to assess prevalence and predictors of mental health service use in New York City (NYC) after the World Trade Center disaster (WTCD). One year after the attacks, we conducted a community survey by telephone of 2368 adults living in NYC on September 11, 2001. In the past year, 19.99% (95% confidence interval [CI]=18.2–21.77) of New Yorkers had mental health visits and 8.1% (95% CI=7.04–9.16) used psychotropic medications. In addition, 12.88% (95% CI=11.51–14.25) reported one or more visits were related to the WTCD. Compared to the year before, 8.57% (95% CI=7.36–9.79) had increased post-disaster visits and 5.28% (95% CI=4.32–6.25) had new post-disaster treatment episodes. Psychotropic medication use related to the WTCD was 4.51% (95% CI=3.75–5.26). Increased post-disaster medication use, compared to the year before, was 4.11% (95% CI=3.35–4.86) and new medication episodes occurred among 3.01% (95% CI=2.34–3.69). In multivariate logistic analyses, mental health visits were associated with younger age, peri-event panic attack, posttraumatic stress disorder (PTSD) and depression. In addition, WTCD-related visits had a positive "dose-response" association with WTCD event exposures ($P<0.0001$). WTCD-related visits also were positively associated with peri-event panic, anxiety, lower self-esteem, PTSD, and depression. All three medication measures were positively related to PTSD and depression, and negatively associated with African American status. WTCD-related medication use also was positively related to younger age, female gender, WTCD event exposures, negative life events, anxiety and lower self-esteem. Finally, while the percentage of New Yorkers seeking post-disaster treatment did not increase substantially, the volume of visits among patients apparently increased. We conclude that exposure to WTCD events was related to post-disaster PTSD and depression, as well as WTCD-related mental health service use. African Americans were consistently less likely to use post-disaster medications. Although the WTCD did have an impact on treatment-seeking among current patients, it did not substantially increase mental health treatment among the general population.

Keywords: Mental health service utilization; Psychotropic medications use; Posttraumatic stress disorder; PTSD; Depression; Community disasters; Terrorism

1. Introduction

Although the psychological sequelae following major disasters often appear brief, studies have shown 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 psychiatric disorders [1–6]. All of these were present in the terrorist attacks in New York City (NYC) on September 11, 2001 [7,8]. Research 6 months post-disaster suggested that while symptoms resolved over time, many not directly affected by the attacks developed symptoms [9]. However, initial surveys indicated that only small population-level increases in mental health service and psychotropic medication use occurred [10–12]. While post-disaster mental health service utilization has been documented before the World Trade Center disaster (WTCD) [10], few studies have focused on population-level mental health utilization [13,14], which is required for public health planning. To

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estimate the prevalence and predictors of mental health service use in NYC after the WTCD, we conducted a community telephone survey of adults 12–14 months after the attacks.

2. Data and methods

All English- or Spanish-speaking adults (18 years or older) living in NYC at the time of the attacks with telephones were potential participants. Using random-digit dialing, we conducted two surveys 1 year after the WTCD. The first was a cross-sectional survey of city residents in the community (the general population sample). The second was a cross-sectional survey of city residents in the community who reported receiving mental health treatment within a year after the attacks (the treatment over-sample). Interviewers determined the number of adults in the household and randomly selected one, based on the most recent birthday. Interviews were conducted from September through December 2002. Questionnaires were translated into Spanish and then back-translated by bilingual Americans to ensure the linguistic and cultural appropriateness. Altogether, 23% of surveys among Hispanics were conducted in Spanish. Trained interviewers experienced in conducting complex health surveys and using a computer-assisted telephone interviewing system conducted all interviews.

In total, 2368 individuals completed the survey (1634 for general population; 734 for treatment over-sample). For this report, the data were weighted to represent a community sample, based on the incidence rates identified in our survey. Sampling weights also were developed to adjust for the number telephone numbers and persons per household. Combined these weights permit the data to be considered representative of the NYC adult population. The survey cooperation rate for our study was 63% [15], similar to what has been reported for other WTCD surveys [8,10–12]. The duration of the interviews was approximately 45 min. The Institutional Review Board of the New York Academy of Medicine approved the study protocols. Surveys were conducted by a firm experienced in conducting health interviews among disaster survivors, victims of sexual assault and combat veterans using telephone surveys. All interviewers were supervised and monitored by the survey contractor in collaboration with the investigative staff.

For our mental health utilization measures we adopted the National Comorbidity Survey (NCS) methodology [16,17]. We asked participants about receiving counseling from a helping professional (e.g., psychiatrist, counselor, physician, self-help group, etc.) for "problems with emotions or nerves or use of alcohol or drugs" in the year prior to and the year after the attacks. Validity studies of self-reported mental health visits suggest that this may underrepresent actual visits, but is fairly accurate when the time-frame is short [17]. Based on previous WTCD studies [10–12], we developed three mental health visit measures: (a) increased post-disaster visits, (b) new post-disaster visit episodes, and (c) visits related to the WTC disaster. Increased visits were based on the difference between the numbers of visits 1 year after the attacks compared to visits 1 year before the attacks. Based on a distributional analysis, we classified an increase of three or more visits as "increased" visits. New post-disaster visit episodes were based on having had visits in the year after the disaster, but not in the year before. Finally, respondents who had post-disaster visits were asked if these were related to the WTCD. If the respondent reported that these visits were related to the attacks, then the individual was classified as having had a WTCD-related visit. Our service visit questions were pretested before final implementation and had been used in previous WTCD surveys [10–12].

Psychotropic medication use was assessed in a similar manner and also adapted from the NCS. Respondents were asked if they had taken any medications prescribed by a doctor, such as antidepressants, tranquilizers, or sleeping pills for emotional problems in the year before and the year after the attacks. Consistent with our visit measures, we develop three medication variables: (a) increased post-disaster medication use, (b) new post-disaster medication episodes, and (c) medications taken related to the WTCD. Increased medication use was based on the difference between the numbers of medication days reported 1 year after the attacks compared to 1 year before the attacks. Similar to service use, an increase of 3 or more medication days post-disaster was classified as "increased" use. New medication episodes were defined based on not having taken medications in the year before the attacks compared to the year after the attacks. Finally, respondents who took medications were asked if any treatments were related to the WTCD, as noted above. As with service visits, these survey questions were pretested before final implementation and had been used in previous WTCD surveys [10–12].

The reason we examined these utilization measures was because initial post-disaster studies in New York suggested only small (e.g.,<2%), population-level increases had occurred contrary to expectations [18]. Given the availability of mental health services in the area, we wanted to confirm this trend over a longer time-frame using multiple measures used in previous studies.

Our study also included measures related to mental health status, functional health status, psychological distress, and several other health-related measures. Our psychiatric symptom measures included the Brief Symptom Inventory-18 (BSI-18), a self-reported psychiatric scale derived from the Hopkins Symptom Checklist [19]. The BSI-18 has been standardized based on a community sample and has clinical cut-off scores to define cases [19]. We used a T score of 65 or higher for case definition, representing a symptom score above the 90th percentile. Cronbach's αs for BSI-18 scales range from 0.74 to 0.89 and test-retest correlations range from 0.68 to 0.90 [19]. Convergent validity for the BSI-18 with the Symptom

Checklist 90-Revised was high, with correlations ranging from 0.91 to 0.96 [19].

Our PTSD scale was based on the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV) [20]. Our measure was specifically developed for telephone administration and used in previous surveys [21,22]. To meet the PTSD criteria in our study, a person first had to be exposed to a traumatic event (Criteria A1) and then experience intense feelings of fear, helplessness, or horror (Criteria A2). Second, the person had to reexperience the event in one of five ways (Criteria B), avoid stimuli associated with the event in three of seven ways (Criteria C), and have increased arousal in two of five ways (Criteria D). Third, the symptoms for Criteria B, C, and D had to last 1 month or longer (Criteria E). Our assessment involved three sets of experiences, including the WTCD, the most stressful traumatic event experienced "other than the WTCD," and any other traumatic event experienced. To have PTSD, the person had to meet the A–E criteria for one or more of these traumatic events. The Cronbach's α for the symptoms used in this scale was 0.90 [10]. In addition, our PTSD scale had κ coefficients with the clinician-administered, Structured Clinical Interviews for DSM-III-R (SCID) of 0.71 for current and 0.77 for lifetime PTSD [22]. To date, versions of this PTSD scale have been used in mental health surveys involving over 16,000 telephone interviews [21,23–26], including several WTCD surveys [10–12]. Furthermore, one recent study comparing our PTSD scale to the PTSD Check List (PCL) [27] among a random subsample of 229 survey participants in NYC found that the PCL had 75% sensitivity and 95% specificity in detecting PTSD cases as classified by our PTSD instrument [28]. In a receiver operating characteristic analysis [29], a PCL cut-off score of $\geq$50, which was the recommended cut-off, also optimally predicted PTSD using our instrument (area under the curve=0.97) [28].

For depression, we used a version of the SCID's major depressive disorder scale from the nonpatients version [30], which also has been used in previous telephone-based population surveys [8,23,26]. Following DSM-IV criteria [20], respondents met the criteria for depression if they had five or more depression symptoms for at least 2 weeks. This scale also had been used in previous WTCD surveys [8,10–12]. Cronbach's α for the 10 symptoms used in this scale in the current study was 0.87. When the diagnostic results for depression in the past 30 days using our depression scale were compared to those obtained by the BSI-18 [19] depression scale among current survey participants, the results were similar to our PTSD scale. The BSI-18 depression scale had 73% sensitivity and 87% specificity in detecting depression cases as classified by our depression instrument [12]. In a receiver operating characteristic analysis [29]), a BSI-depression score of $\geq$65, which was a clinical cutoff for BSI-depression, also optimally predicted depression using our instrument (area under the curve=0.89) [12].

The panic attack measure used was a modified version of the Diagnostic Interview Schedule (DIS) scale for panic [31], phrased to assess symptoms that occurred during or shortly following the terrorist attacks. This scale also was used in recent WTCD telephone surveys [8,10–12]. The scale ascertained panic symptoms in the first few hours after the events of September 11—the presence of at least four or more symptoms constituted a peri-event panic attack [20]. This scale was adopted directly from DIS/DSM-IV [20,31] and, thus, had content, construct, and criterion-related validity. Cronbach's α for the 14 symptoms that made up this scale was 0.85 in our current survey.

Our analyses also included several "stressor" variables. One was related to WTCD event exposures, which was the sum of 14 WTCD-related events potentially experienced during or after the attacks (e.g., fear of being killed, having a friend or relative killed, being forced to move, having financial difficulties, etc.). For our analysis, since we had no a priori method to weight the severity of these events [32], we categorized these into low (0–1 events), moderate (2–3 events), high (4–5 events), and very high (6+ events) exposures. This scale was developed from other disaster studies [33] and had been used in previous WTCD research [8,10–12]. A negative life-event scale also was used, which was the sum of eight experiences that could have happened in the 12 months before the WTCD (e.g., divorce, death of spouse, problems at work, etc.). Again, this scale was developed from other disaster studies [33] and used in previous WTCD research [8,10–12]. In our analyses, this scale was collapsed into low (no events), moderate (1 event), and high (2+ events) negative life exposures. Our third stressor measure assessed 10 traumatic events, other than the WTCD (e.g., having forced sexual contact, being in combat, etc.) [33]. Again, since we had no a priori method to weight the severity of these events [32], they were collapsed into low (0–1 event), medium (2–3 events), and high (4+ events) traumatic event exposures. As with the other scales discussed, the traumatic event scale also was developed from other disaster studies [33] and used in previous WTCD research [8,10–12].

To examine the influence of psychosocial resources, we included measures for social support and self-esteem. The social support scale used was a modified version of the measure utilized in the Medical Outcomes Study [34], which has been included in other WTCD studies [8,10–12]. In the current study, Cronbach's α was 0.83 for this scale. Self-esteem was measured by the Rosenberg self-esteem (RSE) scale [35]. The RSE scale was based on the sum of five items (Cronbach's α=0.73). The RSE scale is a widely used measure that has been incorporated into hundreds of studies [36]. RSE validity studies are numerous and suggest that higher scores were positively correlated with positive attributes, such as high self-regard (r=0.78), and negatively correlated with negative attributes, such as anxiety (r=−0.64) and depression (r=−0.54) [36]. For analytic

purposes, we divided responses for social support and self-esteem into groups reflecting low, moderate, or high levels, based on tertile (one-third) distributions.

To assess functional health status we used the Short-Form 12, version 2 (SF-12-v2) [37]. The reliability and validity of this scale have been documented [37]. Cronbach's α for this instrument's subscales range from 0.81 to 0.87 and correlations of the subscales with the Dartmouth COOP Charts ranged from 0.45 to 0.78 [38]. Lower scores on this scale represent poorer states of health. We used the standardized T score cut-off of <30 to define clinically lower case scores on this scale [37].

Our study analyses also included six demographic variables: age, education, gender, marital status, ethnicity, and income. Age was coded into four categories, including 18–29, 30–44, 45–64, and 65+. Education, gender, marital status, and were dummy-coded with college graduate, female, and married coded 1 and less than college graduate, male, and nonmarried coded 0 (i.e., the reference category). Income was coded into four categories, including under $29,999, $20,000–$99,999, $100,000+, and income unreported; $100,000+ was coded as the reference category. Ethnicity was coded as follows: White, African American, Hispanic, Asian, and "other." "White" was coded as the reference category. In our analyses, we also included two dichotomous measures indicating whether the respondent had health insurance or a primary care physician.

Our analytic approach was to first assess whether the obtained sample matched the population characteristics of NYC. Next, we planned to develop survey point estimates for mental heath disorders and service utilization. After this, we planned to assess population-level changes in pre- vs. post-disaster service utilization using the McNemar χ^2 and Wilcoxon signed-rank tests, measures designed to assess bivariate- and ordinal-level change, respectively [39]. Following the pre/post comparisons, bivariate analyses were planned to summarize associations between our mental health status, stressor, and psychological resource measures. The purpose of these was to assess the concurrent validity of key measures and variable collinearity in our study. Finally, based on these analyses, multivariate logistic regressions were planned to investigate the association between selected predictor variables and the utilization measures described. We also planned to test for interactions for race, age, and gender, because these were often associated with service utilization [40]. We used the survey estimation (svy) command set in Stata (version 7; Stata Corp.) [41] to generate frequency distributions, point estimates, correlations, and our regression models. This adjusted the data for the sampling design, which included case weights to adjust for potentially overrepresenting persons in households with more telephone lines per adult, the treatment over-sample, and survey stratification by 5 NYC boroughs. All *P* values presented are based on two-tailed tests.

3. Results

We compared the weighted age, gender, race/ethnicity, and geographic distributions obtained in our sample to the 2000 US Census statistics for NYC; because the differences were not significant, we concluded that our sample was demographically representative. Next, we examined the survey estimates for posttraumatic stress disorder (PTSD), depression, and service utilization (Table 1). Lifetime and

Table 1
Psychological disorders and mental health services utilization following the World Trade Center disaster in New York City (*N*=2368)

Outcomes	Unweighted *n*[a]	Weighted %	95% CI
Disorders			
PTSD ever	284	8.15	6.87–9.42
PTSD since WTCD	196	5.25	4.23–6.26
PTSD past 6 months	126	3.39	2.54–4.23
Depression ever	621	19.00	17.11–20.83
Depression since WTCD	416	11.76	10.29–13.22
Depression past 6 months	268	7.48	6.30–6.67
Peri-event panic attack	334	10.78	9.29–12.28
Visits			
Any mental health treatment visits ever	1242	38.98	36.56–41.39
Any mental health treatment visits since WTCD	766	19.99	18.20–21.77
Any mental health treatment visits related to WTCD	547	12.88	11.51–14.25
Increased mental health treatment visits since WTCD	332	8.57	7.36–9.79
New mental health treatment visit since WTCD	189	5.28	4.32–6.25
Medications			
Any psychotropic medication use in lifetime	618	16.25	14.7–17.92
Any psychotropic medication use since WTCD	372	8.10	7.04–9.16
Any psychotropic medication use related to WTCD	219	4.51	3.75–5.26
Increased psychotropic medication use since WTCD	192	4.11	3.35–4.86
New psychotropic medication use since WTCD	136	3.01	2.34–3.69

[a] All *n*s are unweighted. Percentages and confidence intervals shown represent the weighted data (i.e., adjustments to the sample for the number of telephone lines and adults in the household, the treatment over-sample, and survey stratification).

1-year prevalence for PTSD was 8.15% (95% confidence interval [CI]=6.87–9.42) and 5.25% (95% CI=4.23–6.26), respectively. For depression, these were 19% for lifetime (95% CI=17.11–20.83) and 11.76% (95% CI=10.29–13.22) for 1-year prevalence, respectively. In both cases, these estimates were similar to those reported in recent national mental heath surveys [42–44]. In terms of mental health visits and medication use in the past year, our estimates were 19.99% (95% CI=18.2–21.77) and 8.1% (95% CI=7.04–9.16), respectively. Again, these estimates were consistent with those reported in recent national survey studies [16,44,45]. Lifetime prevalence of mental health treatment visits among NYC adults was 38.98% (95% CI=36.56–41.39), similar to previously reported [10]. In terms of WTCD-related visits, 12.88% (95% CI=11.51–14.25) of New Yorkers reported one or more visits related to this event. In addition, 8.57% (95% CI=7.36–9.79) had increased post-disaster visits (4% had decreased visits) and 5.28% (95% CI=4.32–6.25) had a new post-disaster visit in the past year.

In terms of psychotropic medication utilization, 16.25% (95% CI=14.7–17.92) reported lifetime use and, as noted, 8.1% (95% CI=7.04–9.16) reported use in the year after the WTCD, respectively. Medication use related to the WTCD was 4.51% (95% CI=3.75–5.26) and increased post-disaster use was 4.11% (95% CI=3.35–4.86) (3.4% had decreased use). Finally, a new medication episode following the WTCD occurred among 3.01% of adults (95% CI=2.34–3.69). Similar to what was found for mental health visits, lifetime psychotropic medication use and use in the past year were consistent with recent national study findings [45–47].

Because our utilization rates did not appear to be substantially higher than those reported in general population surveys, we compared pre-disaster mental health visits in our study to post-disaster visits (Fig. 1). Similar to what had been reported in earlier post-disaster studies [10–12], only small population-level increases in utilization (e.g., 3%) were evident in NYC. Nevertheless, the pre/post differences tended to be significant based on both the McNemar χ^2 and the Wilcoxon signed-rank tests [39].

Data in Table 2 show both the distribution of our predictor variables and their associations with PTSD and depression. The associations shown for age, gender, marital status, and race/ethnicity, are consistent with previous reports [8]. In addition, our stressor exposure, psychological resource, and psychological status variables, are in the expected direction, often suggesting "dose-response" associations with mental health status. For example, PTSD was strongly associated with very high WTCD event exposures (odds ratio [OR]=4.16, $P<0.001$), exposure to negative life events (OR=2.08, $P<0.01$, for 1 event; OR=5.81, $P<0.001$, for 2+ events), and exposure to lifetime traumatic events (OR=2.41, $P<0.001$, for 2–3 events; OR=4.69, $P<0.001$, for 4+ events). In addition, PTSD cases also were more likely to meet the case definition on the BSI for current depression (OR=7.63, $P<0.001$), anxiety (OR=6.90, $P<0.001$), and global severity (OR=7.16, $P<0.001$), as well as the case definition for poor SF-12-v2 mental health (OR=8.34, $P<0.001$). In addition, PTSD was associated with lower social support (OR=2.28, $P<0.01$, for moderate support; OR=2.57, $P<0.001$, for low support), and lower self-esteem (OR=2.39, $P<0.05$, for moderate esteem; OR=7.04, $P<0.001$, for low esteem). These associations were similar, and in some cases stronger, for depression (Table 2). In summary, the data shown in Table 2 document our PTSD and depression measures in terms of criterion-related validity, including concurrent, convergent, discriminant validity [48].

Examination of Pearson r correlations between PTSD and depression symptoms and our psychological resource

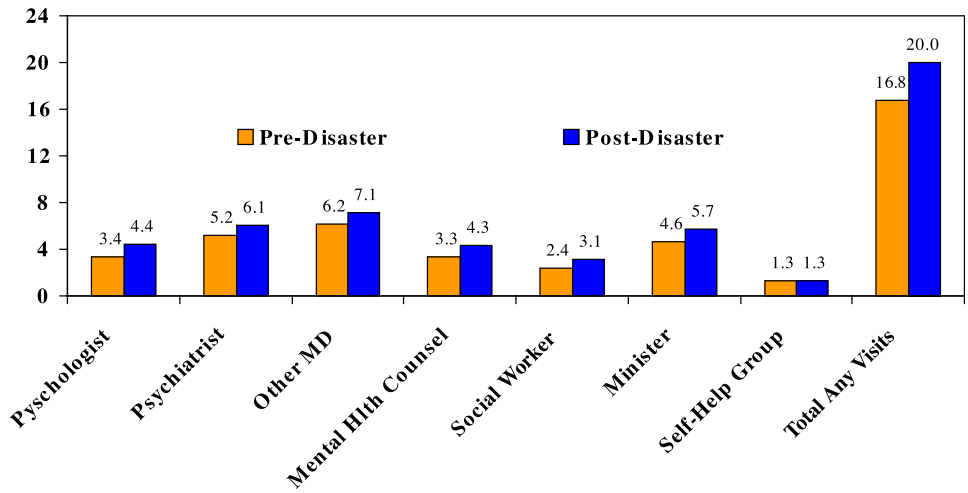

Fig. 1. Percent mental health service use 1 year before vs. 1 year after the World Trade Center disaster in New York City (N=2368). All before vs. after differences shown are statistically significant at P value <0.05, except for social worker and self-help group visits, based on both the pre/post the McNemar χ^2 and the Wilcoxon signed-rank tests, respectively. Percentages shown represent weighted data to adjust the sample for the number of telephone lines and adults in the household, the treatment over-sample, and survey stratification.

Table 2
Bivariate logistic regression coefficients relating PTSD and depression to predictor variables (N=2368)

Independent variables	Study sample		PTSD past year		Depression past year	
	Unweighted n[a]	Weighted % of total	Unadjusted OR	Unadjusted 95% CI	Unadjusted OR	Unadjusted 95% CI
Age (y)						
18–29	483	27.22	3.63*	1.34–9.83	2.08*	1.10–3.92
30–44	866	34.21	2.59*	1.00–6.71	2.41**	1.34–4.35
45–64	726	28.75	2.10	0.79–5.59	1.85*	1.01–3.38
65+ (Ref)	247	9.82	1.00	–	1.00	–
Gender						
Male (Ref)	1016	46.20	1.00	–	1.00	–
Female	1352	53.80	2.04**	1.33–3.13	1.08	0.81–1.45
Education						
Non-college graduate	1304	59.88	1.51	1.00–2.28	1.00	–
College graduate (Ref)	1053	40.12	1.00	–	1.15	0.86–1.53
Marital status						
Not married	1433	53.32	2.25***	1.46–3.47	1.87***	1.40–2.52
Married (Ref)	935	46.68	1.00	–	1.00	–
Race						
White (Ref)	1015	39.25	1.00	–	1.00	–
African American	606	26.32	1.34	0.81–2.24	0.83	0.58–1.19
Latino	559	25.72	1.75*	1.07–2.85	0.96	0.68–1.37
Asian	99	5.20	0.25*	0.09–0.76	0.33**	0.14–0.76
Other	89	3.51	0.60	0.24–1.55	0.82	0.35–1.90
Income						
<$29,999	769	30.91	1.23	0.62–2.43	1.25	0.76–2.08
$30,000–$99,999	1004	40.44	0.63	0.32–1.23	0.92	0.56–1.50
$100,000+ (Ref)	317	14.02	1.00	–	1.00	–
Not reported	278	14.63	0.34	0.11–1.07	0.66	0.33–1.30
Health insurance						
No	330	16.70	1.95**	1.19–3.18	1.16	0.78–1.72
Yes (Ref)	2030	83.30	1.00	–	1.00	–
Has regular doctor						
No	284	14.89	1.60	0.92–2.79	1.13	0.76–1.70
Yes (Ref)	2080	85.11	1.00	–	1.00	–
Exposure to WTCD						
Low (0–1 events) (Ref)	510	26.50	1.00	–	1.00	–
Moderate (2–3 events)	1003	43.96	1.14	0.59–2.24	1.20	0.78–1.87
High (4–5 events)	594	22.00	1.62	0.82–3.20	2.52***	1.63–3.90
Very high (6+ events)	261	7.53	4.16***	2.09–8.30	4.25***	2.60–6.95
Negative life events						
None (Ref)	1197	56.19	1.00	–	1.00	–
One	642	26.97	2.08**	1.20–3.62	2.42***	1.66–3.51
2 or more	529	16.83	5.81***	3.45–9.81	5.09***	3.59–7.22
Lifetime traumatic events						
0,1 event (Ref)	1222	57.03	1.00	–	1.00	–
2,3 events	667	26.19	2.41***	1.41–4.12	1.93***	1.36–2.75
4+ events	479	16.78	4.69***	2.79–7.89	3.48***	2.46–4.93
Peri-event panic attack						
No (Ref)	2034	89.22	1.00	–	1.00	–
Yes	334	10.78	4.19***	2.60–6.77	3.55***	2.52–5.02
Social support						
Low	668	29.36	2.57***	1.52–4.34	1.74**	1.21–2.50
Moderate	825	34.14	2.28**	1.36–3.82	1.87***	1.31–2.66
High (Ref)	829	36.50	1.00	–	1.00	–
Self-esteem						
Low	890	34.52	7.04***	3.83–12.95	8.24***	5.50–12.34
Moderate	573	24.52	2.39*	1.21–4.73	3.22***	1.97–5.26
High (Ref)	893	40.96	1.00	–	1.00	–
BSI-18 Depression Scale						
Not in clinical range (Ref)	1980	88.92	1.00	–	1.00	–
Within clinical range	361	11.08	7.63***	4.96–11.73	12.38***	8.84–17.34
BSI-18 Anxiety Scale						
Not in clinical range (Ref)	1981	89.72	1.00	–	1.00	–
Within clinical range	363	10.28	6.90***	4.56–10.44	9.14***	6.61–12.63

Table 2 (*continued*)

Independent variables	Study sample		PTSD past year		Depression past year	
	Unweighted *n*[a]	Weighted % of total	Unadjusted OR	Unadjusted 95% CI	Unadjusted OR	Unadjusted 95% CI
BSI-18 Global Severity						
Not in clinical range (Ref)	1977	90.02	1.00	–	1.00	–
Within clinical range	346	9.98	7.16***	4.69–10.92	10.69***	7.62–15.00
SF-12-v2 Mental Health						
Not in clinical range (Ref)	2077	93.54	1.00	–	1.00	–
Within clinical range	232	6.46	8.34***	5.19–13.40	10.84***	7.37–15.93

Ref = reference category.

[a] All *n*s are unweighted. Percentages, confidence intervals, and odds ratios shown represent the weighted data, adjusted for the number of telephone lines and adults in the household, the treatment over-sample, and survey stratification.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

and psychological status variables generally indicated strong associations between these measures, with r values >0.35 (data not shown). Based on these findings, we eliminated several redundant variables from multivariate analyses, including BSI-depression, BSI global severity, and SF-12-v2 mental health status.

Table 3 and Table 4 display multivariate results for post-disaster mental health utilization. As can be seen, our WTCD exposure variable was neither significant in the model predicting increased visits nor new visits. Rather, in addition to age, consistent predictors were peri-event panic and, to a lesser extent, PTSD and depression (Table 3). However, in the model predicting WTCD-related visits, not only was WTCD event exposure significant, but results suggested a dose-response effect (OR=2.23, $P<0.001$, for moderate exposure; OR=3.34, $P<0.001$, for high exposure; OR=4.51, $P<0.001$, for very high exposure). Confirming this, a multivariate trend test, based on orthogonal polynomials [49]), was highly significant ($P<0.0001$). In addition, negative life events, peri-event panic, BSI-anxiety, low social support (negative), moderate/low self-esteem, PTSD, and depression were also significant predictors. Furthermore, WTCD-related visits were positively associated with those less than 64 years old and negatively associated with non-college graduates and African Americans.

In terms of medication use (Table 4), African Americans were consistently less likely to have increased use (OR=0.27, $P<0.001$), new use (OR=0.20, $P<0.001$), or medication use related to the WTCD (OR=0.33, $P<0.001$). Lack of health insurance predicted a lower likelihood of increased use (OR=0.36, $P<0.05$) and new use (OR=0.17, $P<0.001$), but not WTCD-related use. For increased medication use, exposure to 2+ negative life events (OR=1.96, $P<0.05$), having PTSD (OR=1.91, $P<0.05$), or having depression (OR=3.26, $P<0.001$) predicted this outcome. With respect to new use, having PTSD (OR=2.14, $P<0.05$) or depression (OR=3.33, $P<0.001$) predicted this. However, for WTCD-related drug use, high WTCD exposures (OR=2.08, $P<0.05$), 2+ negative life events (OR=2.33, $P<0.01$), high BSI-anxiety (OR=2.61, $P<0.001$), low self-esteem (OR=2.14, $P<0.05$), PTSD (OR=1.96, $P<0.01$) and depression (OR=2.63, $P<0.001$) predicted this outcome. Finally, no significant interaction effects were detected for service or drug utilization in our study by age, gender, or race.

4. Discussion

Our study suggested that the percentage of New Yorkers who used mental health services in the community 1-year post-disaster increased slightly from pre-disaster. However, when we assessed this using the Wilcoxon signed-rank test our results were highly significant ($Z=-4.805$, $P<0.001$), suggesting that an increase in the volume of visits had occurred among patients. Psychotropic medication use was also modest 1-year post disaster (e.g., 8% post vs. 9% pre). However, the Wilcoxon signed-rank test for pre- vs. postmedication days was not significant ($Z=-0.56$, $P=0.575$), suggesting no increase in the volume of medication days had occurred among users. In addition, we found the prevalence of PTSD and depression 1-year post disaster was 5.3% and 11.8%, respectively. Furthermore, 12.9% of NYC adults, approximately 793,000 persons, had at least one mental health visit related to the disaster and 4.5% took psychotropic medications because of this event (275,000 persons). Overall, these findings were consistent with reports of earlier post-WTCD utilization [10–12]. In addition, as suggested, the overall PTSD, depression, mental health visit, and medication use rates were consistent with those reported in general epidemiologic studies [16,17,42–47]. This was surprising, because we thought that NYC would have higher pre-disaster rates. For example, in the NCS overall community mental health service visits in the past year was 13.3% [16,17], compared to 16.8% for New York pre-disaster, a difference of only 3.5%.

The analyses suggested that our predictors of PTSD and depression were consistent with previous studies [8,50–53]. As demonstrated (Table 2), PTSD and depression in the past year were positively associated with higher stressor exposures, BSI-depression, BSI-anxiety, BSI-glob-

Table 3
Multivariate logistic regression predicting mental health service visits 1 year post disaster (N=2239)[a]

Independent variables	Increase MH visits		New MH visits		MH visits related WTCD	
	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI
Age (y)						
18–29	2.00	0.84–4.77	2.66*	1.09–6.52	2.37**	1.24–4.51
30–44	3.14**	1.40–7.04	2.59*	1.11–6.05	3.39***	1.88–6.10
45–64	1.94	0.86–4.35	1.74	0.73–4.14	2.76***	1.53–4.97
65+ (Ref)	1.00	–	1.00	–	1.00	–
Gender						
Male (Ref)	1.00	–	1.00	–	1.00	–
Female	0.99	0.69–1.42	1.38	0.90–2.10	1.16	0.86–1.56
Education						
Non-college graduate	0.69	0.47–1.03	0.83	0.53–1.30	0.54***	0.39–0.74
College graduate (Ref)	1.00	–	1.00	–	1.00	–
Marital status						
Not married	0.96	0.67–1.37	0.63*	0.42–0.95	1.17	0.87–1.59
Married (Ref)	1.00	–	1.00	–	1.00	–
Race						
White (Ref)	1.00	–	1.00	–	1.00	–
African American	0.74	0.45–1.22	0.75	0.40–1.37	0.65*	0.43–0.97
Latino	0.95	0.59–1.54	0.55	0.30–1.04	1.10	0.75–1.62
Asian	0.94	0.41–2.15	0.51	0.14–1.87	0.57	0.26–1.28
Other	0.53	0.22–1.28	0.36	0.12–1.08	0.83	0.42–1.66
Income						
<$29,999	1.04	0.57–1.91	0.76	0.37–1.54	1.59	0.93–2.72
$30,000–$99,999	1.05	0.63–1.75	1.08	0.62–1.90	1.05	0.68–1.64
$100,000+ (Ref)	1.00	–	1.00	–	1.00	–
Not reported	0.32*	0.12–0.85	0.37	0.12–1.14	0.78	0.40–1.52
Has health insurance						
No	0.62	0.35–1.09	0.63	0.31–1.29	0.68	0.41–1.13
Yes (Ref)	1.00	–	1.00	–	1.00	–
Has regular doctor						
No	0.70	0.36–1.35	1.28	0.61–2.72	0.64	0.34–1.18
Yes (Ref)	1.00	–	1.00	–	1.00	–
Exposure to WTCD						
Low (0–1 events) (Ref)	1.00	–	1.00	–	1.00	–
Moderate (2–3 events)	1.33	0.78–2.30	1.77	0.93–3.38	2.23***	1.40–3.56
High (4–5 events)	1.40	0.81–2.44	1.61	0.81–3.21	3.34***	2.02–5.50
Very high (6+ events)	1.69	0.87–3.27	1.42	0.67–3.01	4.51***	2.57–7.92
Negative life events						
None (Ref)	1.00	–	1.00	–	1.00	–
One	1.79**	1.20–2.69	1.09	0.65–1.81	1.13	0.80–1.61
2 or more	1.65*	1.06–2.57	0.97	0.55–1.73	1.69**	1.17–2.43
Lifetime traumatic events						
0–1 event (Ref)	1.00	–	1.00	–	1.00	–
2–3 events	1.13	0.78–1.65	1.16	0.75–1.80	1.00	0.72–1.39
4+ events	1.34	0.83–2.17	1.46	0.79–2.72	0.88	0.59–1.31
Peri-event panic attack						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	1.57*	1.01–2.44	1.88*	1.09–3.25	1.93***	1.30–2.88
BSI-18 anxiety						
Low (Ref)	1.00	–	1.00	–	1.00	–
High	1.84**	1.18–2.86	1.07	0.60–1.91	2.35***	1.60–3.47
Social support						
Low	0.78	0.48–1.26	0.79	0.45–1.37	0.64*	0.42–0.96
Moderate	0.97	0.65–1.46	0.90	0.56–1.45	0.83	0.59–1.16
High (Ref)	1.00	–	1.00	–	1.00	–
Self-esteem						
Low	1.51	0.95–2.39	1.12	0.65–1.91	1.56*	1.07–2.26
Moderate	1.41	0.87–2.30	0.95	0.53–1.67	1.60*	1.09–2.37
High (Ref)	1.00	–	1.00	–	1.00	–
PTSD past year						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	1.45	0.88–2.40	2.40**	1.32–4.36	2.14***	1.35–3.37

Table 3 (*continued*)

Independent variables	Increase MH visits		New MH visits		MH visits related WTCD	
	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI
Depression past year						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	1.89**	1.26 – 2.84	1.45	0.87 – 2.42	1.81***	1.26 – 2.61

MH=mental health; Ref=reference category.

[a] All odds ratios and confidence intervals shown represent the weighted data, adjusted for the number of telephone lines and adults in the household, the treatment over-sample, and survey stratification. Regressions are adjusted for all variables shown in table.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

al severity, and poorer SF-12-v2 mental health status (Table 2). Conversely, PTSD and depression also were associated with lower self-esteem and social support. As noted, we believe, these results provide additional evidence for the validity of our telephone-based PTSD and depression measures.

In multivariate analyses (Table 3 and Table 4), we found that WTCD event exposures were associated with WTCD-related visits. WTCD-related visits also were positively associated with stressful life events, PTSD, depression, and anxiety and negatively associated with self-esteem. Also noteworthy was that having insurance coverage was not consistently associated with service visits or drug use, with the exception of new medication episodes (Table 4), whereby lack of health insurance was a negative predictor of drug use (OR=0.17, $P<0.001$). In addition, for all the drug use models examined, African American status was negatively associated with usage. This also was partly true for Asian Americans status as well (Table 4).

Among survivors of the Oklahoma City bombing, 41% reported seeking mental health treatment within 6 months post-disaster [54]. Among the general population within the Oklahoma City metropolitan area, only 8.5% sought help 3 months post-disaster [55]. The latter rate of help-seeking is about as high as those who saw mental health professionals 4–5 months post-disaster in NYC [12]. 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 21.3% of adults used disaster-related support services, but these apparently included other than mental health services [56]. As these few studies suggest, it is difficult to forecast population-level mental health utilization, except to predict that it will usually be higher than it was before the disaster [13,14,52,53]. Complicating the lack of comparability is the fact that many post-disaster studies tend to focus on emergency service utilization [3,57].

In our analyses exposure to environmental stressors and having depression or PTSD were predictors of post-disaster service visits and medication use. Previous research has documented that PTSD was associated with history of traumatic stress exposures, as well as exposure to stressful life events [8,51]. In addition, PTSD has been associated with depression [42,58]. Given previous reports, our medication findings for race and ethnicity are not surprising [40]. Studies have documented racial and ethnic disparities in mental health care, including gaps in access, differences in diagnostic practices, and availability of optimal treatments [59]. Although cultural factors may have played a role [57,60,61], the racial disparities in post-disaster medication use were surprising, given the availability of post-disaster mental health services in NYC [62].

Observations drawn from this study should be interpreted with some caution. At the time of the survey, residents of NYC were on a heightened state of alert and concerned about additional terrorist attacks [10]. These factors may have affected service utilization. Also, we used self-report data collected by telephone, raising the possibility of respondent recall and selection biases. In addition, our study did not include institutionalized persons, those too disabled to undertake a telephone survey, or those who did not speak either English or Spanish. Finally, our PTSD measure may have somewhat overestimated PTSD, because we did not implement PTSD "Criteria F" (impairment) in our survey. As was noted, lifetime PTSD in our study was 8.2%. In recent large-scale epidemiologic surveys, these figures were 7.8% among those age 15–54 [42] and 9.2% among those age 18 – 45 [63]. If we restricted our PTSD estimate to those age 18–54, our estimate was 8.8% (95% CI=7.3–10.3). Thus, our lifetime PTSD estimates appeared fairly consistent with other studies. In addition, our current PTSD estimates (e.g., past year, 5.3%; past 6 months, 3.4%) also appeared consistent with comparable civilian population estimates [64].

Because we had two PTSD impairment measures that were similar to the Criteria F in our study, we used these to develop a PTSD measure that incorporated this indicator. Specifically, respondents that reported positive PTSD symptoms were asked if any of these symptoms had bothered them in the past 30 days. In addition, those who had positive symptoms for Criteria B, C, and D at any time were asked if these symptoms had interfered with their lives. Consistent with the Criterion F, a positive response to either of these meant that PTSD impairment was present. Although these were not exactly the same as the DSM-IV criteria, when applied to lifetime PTSD, there

Table 4
Multivariate logistic regression results predicting psychotropic medication use 1 year post disaster (N=2239)[a]

Independent variables	Increase medication use		New medication use		Medication use related to WTCD	
	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI
Age (y)						
18–29	1.44	0.60–3.43	1.63	0.59–4.51	1.18	0.47–2.94
30–44	1.55	0.68–3.51	1.50	0.56–4.02	2.17	0.95–4.95
45–64	1.30	0.58–2.92	1.52	0.57–4.07	2.18*	1.00–4.76
65+ (Ref)	1.00	–	1.00	–	1.00	–
Gender						
Male (Ref)	1.00	–	1.00	–	1.00	–
Female	1.47	0.93–2.33	1.99*	1.14–3.46	1.66*	1.05–2.60
Education						
Non-college graduate	1.19	0.74–1.93	1.61	0.91–2.85	0.67	0.41–1.08
College graduate (Ref)	1.00	–	1.00	–	1.00	–
Marital status						
Not married	1.03	0.62–1.71	0.67	0.36–1.24	1.35	0.83–2.20
Married (Ref)	1.00	–	1.00	–	1.00	–
Race						
White (Ref)	1.00	–	1.00	–	1.00	–
African American	0.27***	0.15–0.51	0.20***	0.09–0.43	0.33***	0.19–0.57
Latino	0.75	0.41–1.37	0.95	0.49–1.86	0.98	0.57–1.69
Asian	0.26*	0.07–0.95	0.19*	0.04–0.87	0.31	0.09–1.07
Other	0.33*	0.12–0.91	0.43	0.14–1.33	0.64	0.23–1.80
Income						
<$29,999	0.95	0.40–2.25	0.94	0.36–2.48	1.20	0.56–2.58
$30,000–$99,999	0.86	0.49–1.51	0.71	0.35–1.45	0.80	0.44–1.46
$100,000+ (Ref)	1.00	–	1.00	–	1.00	–
Not reported	0.47	0.17–1.27	0.52	0.18–1.56	0.72	0.30–1.75
Health insurance						
No	0.36*	0.13–1.00	0.17***	0.06–0.49	0.59	0.25–1.36
Yes (Ref)	1.00	–	1.00	–	1.00	–
Has regular doctor						
No	0.50	0.18–1.44	0.88	0.29–2.65	0.47	0.18–1.32
Yes (Ref)	1.00	–	1.00	–	1.00	–
Exposure to WTCD						
Low (0–1 events) (Ref)	1.00	–	1.00	–	1.00	–
Moderate (2–3 events)	1.32	0.71–2.46	1.16	0.56–2.45	1.59	0.79–3.20
High (4–5 events)	1.66	0.90–3.05	1.79	0.89–3.60	2.08*	1.05–4.13
Very high (6+ events)	1.31	0.59–2.92	1.58	0.63–4.97	1.81	0.83–3.94
Negative life events						
None (Ref)	1.00	–	1.00	–	1.00	–
One	1.42	0.86–2.35	1.19	0.63–2.28	1.68	0.99–2.86
2 or more	1.96*	1.07–3.57	1.21	0.63–2.35	2.33**	1.36–3.99
Lifetime traumatic events						
0–1 event (Ref)	1.00	–	1.00	–	1.00	–
2–3 events	1.26	0.73–2.16	0.85	0.46–1.56	0.97	0.58–1.61
4+ events	1.22	0.73–2.04	1.10	0.59–2.04	0.99	0.62–1.59
Peri-event panic attack						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	1.37	0.72–2.62	1.17	0.56–2.46	1.41	0.85–2.35
BSI-18 anxiety						
Low (Ref)	1.00	–	1.00	–	1.00	–
High	1.77	0.98–3.16	1.83	0.89–3.78	2.61***	1.60–4.26
Social support						
Low	1.44	0.82–2.53	1.21	0.60–2.48	0.65	0.35–1.23
Moderate	0.96	0.58–1.59	0.69	0.36–1.33	0.84	0.52–1.35
High (Ref)	1.00	–	1.00	–	1.00	–
Self-esteem						
Low	1.40	0.71–2.78	1.63	0.75–3.56	2.14*	1.15–3.97
Moderate	1.23	0.68–2.22	1.48	0.76–2.88	1.44	0.77–2.64
High (Ref)	1.00	–	1.00	–	1.00	–
PTSD past year						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	1.91*	1.11–3.29	2.14*	1.19–3.86	1.96**	1.19–3.22

Table 4 (*continued*)

Independent variables	Increase medication use		New medication use		Medication use related to WTCD	
	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI	Adjusted OR	Adjusted 95% CI
Depression past year						
No (Ref)	1.00	–	1.00	–	1.00	–
Yes	3.26***	2.02 – 5.23	3.33***	1.90 – 5.84	2.63***	1.65 – 4.18

Ref = reference category.

[a] All odds ratios and confidence intervals shown represent the weighted data, adjusted for the number of telephone lines and adults in the household, the treatment over-sample, and survey stratification. Regressions are adjusted for all variables shown in table.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

was a decrease of 1.7% from 8.2% to 6.5%. (95% CI=5.5–7.6). However, when we restricted our sample to those less than 55 years old to be consistent with the NCS [42], our lifetime prevalence was 7.1% (95% CI=5.8–8.4), very close to the 7.8% reported in that study. In addition, when we compared the lifetime prevalence of PTSD for men and women under 55 years old, these figures were 4.5% (95% CI=3.2–6.2) and 9.5% (95% CI=7.6–11.8), respectively, nearly the same as reported in the NCS [42]. Therefore, while the PTSD measure used in our study is likely to have overestimated this disorder somewhat, it appears to have been minimal.

Despite these limitations, this study is one of a few to examine longitudinal, population-level mental health utilization in the community after a catastrophic event. While mental health service use was not as high as expected [18,65], there did appear to be a surge in the volume of visits among existing patients. In addition, the finding that African Americans were less likely to take post-disaster psychotropic medications, despite the availability of services in NYC, requires further study. Whether this was due to differences in perceptions [66], actual prescribing practices [67], or other factors is unclear. Shortly after the disaster, significant ethnic differences in utilization were noted [61]. One year later, these differences remained for medication use, but not for service visits. Previously it was reported that a major reason persons did not seek post-WTCD mental health services was because they felt that they had the support of their family, friends, and coworkers [24]. In addition, only 24% of New Yorkers were apparently aware of free mental health services through "Project Liberty" in NYC [68]. This is puzzling because we thought that this program was well promoted. One explanation for these findings is that the psychological resilience of many New Yorkers may have been higher than expected [69]. Given the potential for future terrorist attacks, additional research is needed to assess this and other critical factors affecting public health outcomes in these situations in the near future.

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References

[1] Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J Consult Clin Psychol 2000;68:748 – 66.

[2] Bromet EJ, Dew MA. Review of psychiatric epidemiologic research on disasters. Epidemiol Rev 1995;17:113 – 9.

[3] Green BL. Evaluating the effects of disasters. Psychol Assess 1991;3:538 – 46.

[4] Norris FH. Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. J Consult Clin Psychol 1992;60:409 – 18.

[5] Noji EK. The nature of disaster: general characteristics and public health effects. In: Noji EK, editor. The public health consequences of disasters. New York: Oxford University Press; 1997. p. 3 – 20.

[6] Rubonis AV, Bickman L. Psychological impairment in the wake of disaster: the disaster-psychopathology relationship. Psychol Bull 1991;109:384 – 99.

[7] Centers for Disease Control and Prevention. Community needs assessment of lower Manhattan residents following the World Trade Center attacks—Manhattan, New York City, 2001. Morb Mortal Wkly Rep 2002;288(10):1227 – 8.

[8] Galea S, Ahern J, Resnick H, et al. Psychological sequelae of the September 11 terrorist attacks in New York City. N Engl J Med 2002;346:982 – 7.

[9] Galea S, Vlahov D, Resnick H, et al. Trends in probable posttraumatic stress in New York City after the September 11 terrorist attacks. Am J Epidemiol 2003;158:514 – 24.

[10] Boscarino JA, Galea S, Ahern J, Resnick H, Vlahov D. Utilization of mental health services following the September 11th terrorist attacks in Manhattan, New York City. Int J Emerg Mental Health 2002;4:143 – 55.

[11] Boscarino JA, Galea S, Ahern J, Resnick H, Vlahov D. Psychiatric medication use among Manhattan residents following the World Trade Center Disaster. J Trauma Stress 2003;16:301 – 6.

[12] Boscarino JA, Galea S, Adams RE, Ahern J, Resnick H, Vlahov D. Mental health services and psychiatric medication use following the terrorist attacks in New York City. Psychiatr Serv 2004; 55:274 – 83.

[13] Burkle FM. Acute-phase mental health consequences of disasters: implications for triage and emergency medical services. Ann Emerg Med 1996;28:119 – 28.

[14] Gleser GC, Green BL, Winget C. Prolonged psychosocial effects of disaster: a study of Buffalo Creek. New York (NY): Academic Press; 1981.

[15] American Association for Public Opinion Research. Standard definitions: final dispositions of case codes and outcomes rates for surveys. Ann. Arbor (MI): American Association for Public Opinion Research; 2000.
[16] Kessler RC, Zhao S, Katz SJ, et al. Past-year use of outpatient services for psychiatric problems in the National Comorbidity Survey. Am J Psychiatry 1999;156:115–23.
[17] Kessler RC, Frank RG, Edlund M, Katz SJ, Lin E, Leaf P. Differences in the use of psychiatric outpatient services between the United States and Ontario. N Engl J Med 1997;336:551–7.
[18] Herman D, Felton C, Susser E. Mental health needs in New York State following the September 11th attack. J Urban Health 2002;79:322–31.
[19] Derogatis LR. Brief symptom inventory 18 (BSI-18) manual. Minnetonka (MN): NCS Assessments; 2001.
[20] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington (DC): American Psychiatric Association; 1994.
[21] Resnick HS, Kilpatrick DG, Dansky BS, Saunders BE, Best C. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. J Consult Clin Psychol 1993;61:984–91.
[22] Kilpatrick DG, Resnick HS, Freedy JR, et al. The posttraumatic stress disorder field trial: evaluation of the PTSD construct-criteria A through E. In: Widiger T, Frances A, Pincus H, et al, editors. DSM-IV sourcebook, vol. 4. Washington (DC): American Psychiatric Association Press; 1998. p. 803–44.
[23] Acierno R, Kilpatrick DG, Resnick H, Saunders B, De Arellano M, Best C. Assault, PTSD, family substance use, and depression as risk factors for cigarette use in youth: findings from the National Survey of Adolescents. J Trauma Stress 2000;13:381–96.
[24] Boscarino JA, Adams RE. Mental health treatment in New York City 1 year after the terrorist attacks. Presented at the 20th Annual Academy Health Meetings, Nashville, TN, June 2003.
[25] Vlahov D, Galea S, Ahern J, et al. Consumption of cigarettes, alcohol, and marijuana among New York City residents six months after the September 11 terrorists attacks. Am J Drug Alcohol Abuse 2004;30:385–407.
[26] Kilpatrick DG, Ruggiero KJ, Acierno R, Saunders BE, Resnick HS, Best CL. Violence and risk of PTSD, major depression, substance abuse/dependence, and comorbidity: results from the national survey of adolescents. J Consult Clin Psychol 2003;71:692–700.
[27] Blanchard EB, Jones-Alexander J, Buckley TC, et al. Psychometric properties of the PTSD checklist. Behav Res Ther 1996;34: 669–73.
[28] Galea S, Vlahov D. Mental health in the New York City metropolitan after the September 11 attacks: research of the New York Academy of Medicine. In: Smith T, editor. The social, psychological, and political impact of the September 11th terrorist attacks on the American public. New York: Russell Sage Publications; 2004 [in press].
[29] Pepe MS. The statistical evaluation of medical tests for classification and prediction. Oxford, UK: Oxford University Press; 2003.
[30] Spitzer RL, Williams JB, Gibbon M. Structured clinical interview for DSM-III-R-non-patient version. New York: Biometrics Research Department, New York State Psychiatric Institute; 1987.
[31] Robins LN, Cottler LB, Bucholz KK, Compton WM, North CS, Rourke KM. Diagnostic interview schedule for DSM-IV. St. Louis (MO): Washington University School of Medicine, Department of Psychiatry; 1999 [Revised January 9, 2002].
[32] Stamm BH. Contextualizing death and trauma: a preliminary endeavor. In: Figley CR, editor. Death and trauma. New York: Brunner/Mazel; 1996. p. 3–21.
[33] Freedy JR, Kilpatrick DG, Resnick HS. Natural disasters and mental health: theory, assessment, and intervention. [Special issue: Handbook of post-disaster interventions] J Soc, Behav Pers 1993;8:49–103.
[34] Sherbourne CD, Stewart AL. The MOS social support survey. Soc Sci Med 1989;32:705–14.
[35] Rosenberg M. Conceiving the self. New York: Basic Books; 1979.
[36] Blascovich J, Tomaka J. Measure of self-esteem. In: Robinson JP, Shaver PR, Wrightsman LS, editors. Measures of personality and social psychological attitudes. New York: Academic Press; 1991. p. 115–60.
[37] Ware JE, Kosinski M, Tuner-Bowker DM, Gandek B. Version 2 of the SF-12 health survey. Boston (MA): Quality Metric; 2002.
[38] McDowell I, Newel C. Measuring health. 2nd ed. New York: Oxford University Press; 1996.
[39] Sprent P, Smeeton NC. Applied nonparametric statistical methods. 3rd ed. New York: Chapman and Hall/CRC; 2001.
[40] US Department of Health and Human Services. Mental health: a report of the Surgeon General. Rockville (MD): US Department of Health and Human Services, National Institute of Mental Health; 1999.
[41] Stata Corporation. Stata, version 7.0. College Station (TX): Stata Corporation; 2001.
[42] Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey. Arch Gen Psychiatry 1994;51:8–19.
[43] Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the National Comorbidity Survey. Arch Gen Psychiatry 1995;52:1048–60.
[44] Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). JAMA 2003;289:3095–105.
[45] Aparasu RR, Mort JR, Brandt H. Psychotropic prescription use by community-dwelling elderly in the United States. J Am Geriatr Soc 2003;51:671–7.
[46] Ohayon MM, Lader MH. Use of psychotropic medications in the general population of France, Germany, Italy, and the United Kingdom. J Clin Psychiatry 2002;63:817–25.
[47] Pincus HA, Zarin DA, Tanielian TL, et al. Psychiatric patients and treatments in 1997: findings from the American Psychiatric Practice Research Network. Arch Gen Psychiatry 1999;56:441–9.
[48] Dunn G. Statistics in psychiatry. New York: Oxford University Press; 2000.
[49] Winer BJ, Brown DR, Michels KM. Statistical principles in experimental design. 3rd ed. New York: McGraw-Hill; 1991.
[50] Bromet E, Sonnega A, Kessler RC. Risk factors for DSM-III-R posttraumatic stress disorder: findings from the National Comorbidity Survey. Am J Epidemiol 1998;147:353–61.
[51] Kulka RA, Schlenger WE, Fairbank JA, et al. Trauma and the Vietnam War generation: report of findings from the National Vietnam Veterans Readjustment Study. New York: Brunner/Mazel; 1990.
[52] Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak. Part I: An empirical review of the empirical literature, 1981-2001. Psychiatry 2002;65:207–39.
[53] Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak. Part II: Summary and implications of the disaster mental health research. Psychiatry 2002;65:240–60.
[54] North CS, Nixon SJ, Shariat S, et al. Psychiatric disorders among survivors of the Oklahoma City bombing. J Am Med Assoc 1999;282:755–62.
[55] Smith DW, Christiansen EH, Vincent R, Hann NE. Population effects of the bombing of Oklahoma City. J Okla State Med Assoc 1999;92:193–8.
[56] Carr VJ, Lewin TJ, Carter GL, Webster RA. Patterns of service utilization following the 1989 Newcastle earthquake: findings from phase 1 of the quake impact. Aust J Public Health 1992; 16:360–9.
[57] Gerrity ET, Flynn BW. Mental health consequences of disasters. In: Noji EK, editor. The public health consequences of disaster. New York: Oxford University Press; 1997. p. 101–32.
[58] Galea S, Boscarino J, Resnick H, Vlahov D. Mental health in New York City after the September 11 terrorist attacks: results form two population surveys. In: Manderscheid RW, Henderson MJ, editors.

Mental health, United States 2001. Washington (DC): Government Printing Office; 2003. p. 83–91.
[59] Snowden LR. Bias in mental health assessment and intervention: theory and evidence. Am J Public Health 2003;93:239–43.
[60] Cauce AM, Domenech-Rodriguez M, Paradise M, et al. Cultural and contextual influences in mental health help seeking: a focus on ethnic minority youth. J Consult Clin Psychol 2002;70:44–55.
[61] Boscarino JA, Galea S, Ahern J, Resnick H, Vlahov D. Access to psychiatric services in New York City following the September 11th terrorist attacks. Ann Epidemiol 2002;12:514.
[62] Quervalu I. Project Liberty New York City. New York: The New York City Department of Mental Health, Mental Retardation, and Alcoholism; 2002.
[63] Breslau N, Kessler RC, Chilcoat HD, Schultz LR, Davis GC, Andreski P. Trauma and posttraumatic stress disorder in the community: the 1996 Detroit area survey of trauma. Arch Gen Psychiatry 1998;55: 626–32.
[64] Kulka RA, Schlenger WE, Fairbank JA, et al. The National Vietnam Veterans Readjustment Study: tables of findings and technical appendices. New York: Brunner/Mazel; 1990.
[65] Psychiatric News JA. Mental illness crisis fails to materialize. Psychiatric News 2002;37:23.
[66] Choghan TW, Tomlin M, Pescosolido BA. American attitudes toward and willingness to use psychiatric medications. J Nerv Ment Dis 2003;191:166–74.
[67] Pincus HA, Tanielian TL, Marcus SC, et al. Prescribing trends in psychotropic medications: primary care, psychiatry, and other medical specialties. JAMA 1998;279:526–31.
[68] Rudenstine S, Galea S, Ahern J, Felton C, Vlahov D. Awareness and perception of a community-wide mental health program in New York City after September 11. Psychiatr Serv 2003;53:1404–6.
[69] Bonanno GA. Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? Am Psychol 2004;59:20–8.