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AFTERMATH OF A DISASTER: PSYCHOLOGICAL RESPONSE TO THE  
INDIANAPOLIS RAMADA JET CRASH

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RESPONSE TO THE INDIANAPOLIS RAMADA JET CRASH

DESCRIPTION OF THE DISASTER EVENT

At approximately 9:20 A.M. on October 20, 1987 an Air Force jet fighter crashed into the lobby of the Ramada Inn in Indianapolis. The event was completely unexpected and occurred without warning. Although the hotel had been fully occupied the previous night, most of the guests had already checked out; the majority of those present were hotel employees. There were nine immediate fatalities, all hotel employees. The remaining 22 employees were safely evacuated immediately after the crash, except for one hospitalized with burn injuries. There was one non-employee fatality, a salesman who had stopped to use a hotel phone, and who died of burn injuries approximately one week after the crash.

This disaster was marked by a considerable degree of horror and terror. Survivors told stories of looking out a picture window to see the plane flying toward them; shrapnel from the plane blasting through walls five floors away; trapped victims crying and screaming for help and beating on the walls as they died; bodies charred beyond recognition and blown to pieces; and a man who came running out of the hotel in flames. (See newspaper accounts in appendix.)

Upon emerging to safety outside the burning hotel, the immediate impulse for many victims was to go back in to rescue those still trapped inside. Several tried, but were immediately turned back by intense heat and smoke, only to stand helplessly, listening with horror to their co-workers' screams from inside as they perished. The scene outside was chaos, with the first arrivals of the 100 emergency and fire vehicles, swarms of newspaper and television reporters, and crowds of onlookers and worried relatives. These crowds hampered frustrated victims in their frenzy to locate their loved ones.

Red Cross rescue workers set up a waiting room for victims and their families at a hotel a block away. With the help of the victims, workers began compiling a list of the missing. Early estimates of fatalities were reported as high as 50. By 4 P.M., about 17 people were still unaccounted for. Throughout the day, the employees waited together, hugging each other, and sharing photos from their wallets and crying together. The Ramada employees described themselves as a close-knit group, like a family. Some had worked together for many years. After the crash they pulled even closer together, providing support for each other in a way that no one else could. By 10 P.M. all but a few of the victims' bodies had been identified, and the remaining victims and families went home. All had lost friends and co-workers; some had lost close relatives.

There was a prompt response by the National Organization for Victims' Assistance (NOVA), and group counseling was provided to all employees within a few days of the crash. As a result of the accident the hotel was closed for what has proved to be an indefinite period; thus most employees suffered a secondary loss of employment. With the sudden lack of income, some were unable to pay rent and were forced to move. The Air Force remunerated victims for losses of their possessions and, in some cases, for their loss of income. However, this assistance was reportedly irregular and indefinite. A temporary office was set up by Ramada Inn management and this enabled the employees to maintain contact with each other. However, this was made more difficult due to uncertainty about the future of the hotel, many individuals began to look for other jobs.

#### METHODS

We learned of the plane crash as we were preparing the quick response grant application for study of the psychological impact of various types of

disasters and included it in the proposal as one of the events to be studied. Prompt notification of funding allowed us to begin our research efforts within ten days after the disaster. The initial contact was with the Disaster Services Office of the American Red Cross in Indianapolis. This yielded valuable information regarding the disaster as well as linking us with the owner of the Ramada Inn. A phone call to the owner indicating our interest in studying the psychological effects of this event brought an immediate response from his assistant. Both he and the owner had been scheduled to be in the hotel in the lobby area where most of the fatalities occurred on the morning of the crash. However, one forgot to set his alarm and overslept; the other was delayed by another meeting. There were in fact a number of individuals who were supposed to be there that day but were not because of a cancelled meeting, changing schedules, a doctor's appointment, car trouble, etc. Conversely, there were others who should not have been there, like the local salesman who was killed.

Although we had originally planned to study individuals (employees and guests) who were present at the time of the disaster, most of the hotel guests had departed and hotel records of their registrations destroyed in the fire; thus they could not be readily located. Instead it was elected to interview as many of the 61 surviving employees as possible. Since the community of hotel employees was so close-knit, it was expected that even those not present at the time of the crash might have experienced psychological sequelae. This unusual arrangement of the occurrence of a severe disaster in a circumscribed community of co-workers was ideal for an epidemiological study of this type. It provided a rare opportunity to study an entire population of disaster victims, systematically, in the acute phase following the event. The inclusion of off-site employees also allowed the unique opportunity to test

the hypothesis of a dose-response relationship between level of exposure to the disaster and degree of emotional upset.

Letters were sent to the 61 surviving hotel employees explaining the study and inviting them to participate by responding via enclosed self-addressed postcards or by telephone. If no response was received, the investigators followed up with a telephone call.

### Sample

A total of 46 individuals were interviewed. Seventeen (37%) of these were on-site at the hotel at the time of the crash. Of note, one non-employee, a hotel guest, was included in the count of off-site individuals, since he had been staying at the hotel on business for several months, and was generally considered by the employees to be a valued member of their "community" of co-workers at the Ramada. Seven subjects refused to be interviewed (19% on-site and 9% off-site) for an overall refusal rate of 13%. Nine individuals (14%) could not be located due to complications of the disaster (destroyed records; newly unemployed victims having to move for financial reasons). Only one of the unlocated subjects was in the on-site group. The total completion rate was 74%, fairly evenly divided between the on-site (77%) and off-site (72%) groups.

Most persons interviewed agreed to participate because they wanted to be of help in a research effort which they thought might benefit others in the future. Others felt a need to talk about their experience or saw it as an opportunity to obtain help personally. Among the on-site individuals who refused, several indicated that they believed it would be too upsetting to talk about the disaster experience and one had been advised by a lawyer to sign nothing and talk to no one. Other respondents reported that these on-site refusers were among those they considered to be the most upset. In

contrast, the refusals in the off-site group seemed to be primarily due to a lack of involvement or impact of the disaster. Most of the unlocated individuals were contract workers who had limited contact with the rest of the close-knit community of employees.

### Instruments

Subjects were interviewed about their psychiatric and social status using a modified version of the Diagnostic Interview Schedule/Disaster Supplement (DIS/DS) (Robins and Smith 1983). This interview was designed for the ECA Hazards study funded by NIMH (Smith et al. 1986) and has been used by investigators in several recent disaster studies. It elicits information about the disaster experience and the individuals' perceptions of the event, use of formal and informal support systems, behavioral response to the traumatic event, and 15 DSM-III diagnoses selected for their potential relevance to the disaster experience. In this study only the following diagnostic categories were included: post-traumatic stress disorder, depression, somatization disorder, generalized anxiety disorder, panic disorder, phobic disorders, antisocial personality disorder (adult component), alcohol abuse/dependence, and drug abuse/dependence.

For each disorder that was ascertained to have occurred, age of onset and age at last symptom were obtained, thus providing lifetime as well as current psychiatric status. Onset and recency for each positive symptom of the relevant diagnoses were also obtained. Thus information was available as to the presence or absence of each symptom during the interval between the disaster and the interview, and prior to the disaster.

The disaster interview also contained a number of other measures that might be sensitive to changes in mental health. These included use of health services and psychoactive drugs, health and disability status, role function,

and social support. In addition to these questions, all of which were part of the ECA interview, the disaster section explored the disaster experience and its meaning for the respondents. All participants were asked to evaluate news coverage of the disaster, on whom they blamed the disaster, and whether other stressful life events had occurred in the last year.

Subjects were also asked to complete two self-administered forms: the Impact of Events Scale (Horowitz et al. 1979), a 15-item questionnaire which measures current subjective distress related to experiencing a stressful life event; and the Tridimensional Personality Questionnaire (Cloninger 1986).

The majority of interviews were conducted in-person and were completed at four to six weeks after the disaster event. For various reasons, a few interviews could not be scheduled in person and were completed by telephone. Interviews were conducted by the authors, two fourth-year psychiatry residents, and a research assistant. All subjects were offered \$10.00 for participating. The interview took on average approximately ninety minutes to administer.

Data Analysis. For the purposes of analysis, the subject group was divided into three categories: "hit" or on-site (N=17), "near-hit" (N=12), and "miss" (N=17). The "near-hit" included those who had originally been scheduled to be at work at the time of the crash, but for one reason or another were not there -- e.g., oversleeping, illness, cancelled meeting. The "miss" group consisted of those employees who were not on-site and who were not scheduled to be working that day -- e.g., nighttime bartender and entertainment employees.

Because of the limited size of the study sample, tests of significance were not performed. The results will be presented in a descriptive fashion.

## RESULTS

Demographic Information. The sample was two-thirds female and mostly Caucasian, with a mean age of 29.2. Sex ratios, race, and age were similar in all subgroups (Table 1). The sample contained a sizable number of part-time and unskilled workers, which may help to explain the relatively young age of the group. Given this characteristic, rates of pre-existing psychopathology might be lower than expected, since many subjects would not have yet reached the age of risk for many psychiatric disorders. On-site victims were more often married than either of the off-site groups. Most of the subjects had completed high school or had obtained a G.E.D., and the "near-hit" group had the highest frequency of individuals who had finished high school and attended college. This may reflect the fact that a meeting of the better-educated management employees was cancelled at the last minute, and all these individuals would have likely been killed in the meeting room which was located near the point of the jet's impact.

Subjective distress and attribution of blame. Respondents were asked how upset they had been after the plane crash, and how much they felt they had been harmed. Perceived degree of upset (Table 2) was scored high ("very upset") by most respondents. It was not surprising that 100% of those on-site reported that they were very upset. The "miss" group contained the smallest proportion of "very upset" subjects, reflecting a dose-related response pattern. Over seventy percent of those on-site and at least one half of the respondents in the two off-site groups believed that the disaster had caused a great deal of harm. Only one-fourth of subjects felt that they had completely recovered, and the on-site victims were less likely than either of the off-site groups to report full or partial recovery.



Respondents were also asked if they thought the disaster was just an act of God or nature, or whether they thought the victims or any other individuals, industries, or government agencies were in any way to blame for the degree of damage. While 100% of on-site victims felt the disaster reflected just an act of God or nature, many of the off-site subjects blamed the victims. About two-thirds at least partially blamed other individuals or agencies with little variation across the subgroups.

Various respondents blamed the Air Force for not maintaining its jet better; a few blamed the pilot for bringing a disabled jet into such a populated area; many blamed the air traffic controllers for not communicating properly with the pilot. Rarely, airport personnel were blamed for not calling the fire department to inform them that there had been no explosives on the plane, which they believed would have allowed the rescue workers to enter the burning hotel more quickly and save more lives. Others blamed the President and the Governor for not calling to express their sympathy, and for not declaring the area a national disaster site. For those who blamed their fellow victims, the blame was often ascribed to those who died because they had gone back inside the burning hotel to rescue their belongings rather than escaping to safety when they might have. Some blamed themselves for not being able to rescue others, even when they recognized that the rescue was not physically possible.

#### Psychiatric Impact.

As shown in Table 3, one-third of the sample developed a new diagnosis [including post-traumatic stress disorder (PTSD) by DSM-III criteria, alcohol abuse/dependency, major depression, and generalized anxiety disorder] following the disaster, i.e., incident cases. These new disorders appeared in a very apparent dose response fashion, with over half of the on-site subjects developing a new disorder, diminishing to only 12% in the "miss" group.

Over half the sample met criteria for a psychiatric diagnosis (prevalence) following the disaster, and unlike the incidence rates the prevalence rate did not vary by degree of exposure. Separating these two rates of disease occurrence carves out those incident cases which were specifically associated with the occurrence of the disaster.

Symptoms of PTSD were among the most common of symptoms experienced by disaster survivors and these did not vary in frequency by sex distribution. Three-quarters of the sample reported having at least one of the nine possible DSM-III symptoms of PTSD, averaging 4.17 symptoms per subject (Table 4). Number of subjects reporting symptoms varied in a dose-response fashion, with 100% of the on-site victims experiencing one or more PTSD symptoms. This group also had the highest mean number of symptoms per subject. The "miss" group, with the lowest number of symptoms per subject, still scored at least one positive symptom in over half of subjects. The symptom with the highest frequency of endorsement was recurring dreams/intrusive recollections, reported by almost three quarters of subjects and 94% of on-site victims. In the "miss" group, insomnia was the most common symptom, acknowledged by about half.

Twenty-two percent of all victims met full DSM-III criteria for PTSD after the disaster, with a mild dose-response relationship (Table 5). Although the interview was not designed to make DSM-IIIR diagnoses, reported symptoms were fit as closely as possible into DSM-IIIR criteria, and the data were re-analyzed. While it is recognized that this is not a perfectly matched comparison due to the two different methodologies, it makes for at least a rough comparison of DSM-III and DSM-IIIR criteria for PTSD in the same population. The overall prevalence of post-disaster PTSD rose from 22% to 33% when DSM-IIIR criteria were used. This is largely due to the fact that the

DSM-III-R criteria do not require the presence of numbness and that the new criteria do not include the presence of survivor guilt. Numbness and survivor guilt were the two DSM-III symptoms least frequently endorsed by the subjects. Most cases of post-disaster PTSD were cases that arose de novo, i.e. without any prior history of the PTSD syndrome. All cases of PTSD in on-site victims appeared de novo following the disaster; this pattern was not seen in the off-site subjects whose PTSD represented a recurrence of a previous PTSD episode as frequently as it represented development of a de novo disorder.

Of interest, none of the on-site victims recalled any prior history of a PTSD episode, but 14% of the off-site group recalled a prior episode. This suggests that the high frequency and severity of post-disaster PTSD syndromes in the on-site victims may have blotted out their memories of prior episodes of PTSD that the off-site victims were able to recall. Alternatively, perhaps the off-site victims may have volunteered past PTSD symptoms to compensate for their lack of current PTSD symptoms.

Twenty percent of the respondents were abusing or dependent on alcohol prior to the disaster (not shown), and about half this number of subjects was actively abusing alcohol after the disaster (Table 6). Those abusing alcohol following the disaster were not necessarily the same ones having a history of prior alcohol abuse. The two subjects developing alcohol abuse for the first time after the disaster were both in the on-site group. About half of the alcohol abuse cases also met criteria for dependence. Post-disaster alcohol diagnoses did not vary in frequency between on-site and off-site groups.

Approximately one-fifth of the respondents met criteria for a previous episode of depression (not shown), and on-site victims recalled somewhat less in the way of past depressions than either the "near-hit" or "miss" groups.

Depression was the most common post-disaster diagnosis, with over two-fifths of subjects meeting criteria (Table 6). Although not shown on the table, males were slightly over-represented in depressive cases. In the on-site group, new or de novo depression occurred in one-fourth of the sample, and this frequency decreased to half that amount in the "miss" group. Impressively, 100% of all individuals with a prior depression had a recurrence following the disaster in all subgroups (not shown). Thus, pre-existing depressive history appears to strongly predict relapse or persistence following disaster in this sample.

On-site victims had twice the prevalence rate of post-disaster generalized anxiety disorder as off-site victims with a rate of approximately one in five for the entire sample (Table 6). Frequency did not vary by sex. Anxiety disorders in on-site subjects appeared de novo following the disaster about as often as they represented a recurrence. There were no new-onset anxiety disorders in the "miss" group.

There was considerable overlap in the post-disaster occurrence of the three most prevalent diagnoses: depression, PTSD, and generalized anxiety disorder (Table 7). Over half of the subjects met criteria for at least one of these three diagnoses, and a third of the sample had two or more diagnoses. Thirty percent of subjects met criteria for one of these three diagnoses, 35% met criteria for two, and 7% met criteria for three (not shown). PTSD occurred four times more frequently in conjunction with one of the other two diagnoses than it did alone. Generalized anxiety disorder occurred in conjunction with another diagnosis eight times more frequently than it did alone.

When the tabulation was expanded and repeated to include data on alcohol disorders (the least frequent of diagnoses), it was found that those abusing alcohol usually met criteria for at least one other non-alcohol diagnosis.

Single-diagnosis cases of alcohol disorders, PTSD, and generalized anxiety disorder did not add much to the overall prevalence rate of psychiatric disorders. The diagnosis of depression was the most likely of these four disorders to occur in the absence of another.

Since the majority of the sample reported feeling somewhat upset or very upset about the disaster, this variable did not provide a useful correlation with more objective measures. However, subjects gave more heterogeneous responses to questions about subjective perceptions of harm, and this subjective measure was objectively supported by the finding of higher frequencies of psychiatric diagnoses occurring in subjects expressing the greatest perceived harm (Table 8). A psychiatric diagnosis was present in all subjects who reported that they had not recovered. Surprisingly, almost one-fourth of those with at least one diagnosis felt fully recovered despite their diagnosable psychopathology. This unusual subset averaged 2.00 diagnoses per subject; the most common diagnosis was depression in five of the six (not shown).

Predictors of post-disaster psychiatric status. Forty-three percent of subjects gave a pre-disaster history of one of the following four psychiatric diagnoses: PTSD, major depression, alcohol abuse/dependence, and generalized anxiety disorder (not shown). The proportion having a pre-disaster psychiatric diagnosis was highest in the "miss" group (47%) and lowest among the on-site victims (35%).

In the Epidemiologic Catchment Area project, a survey assessing the prevalence of mental disorders in the general population (Robins et al. 1984), it was found that 29-38% of the sample had experienced at least one of the fifteen DSM-III disorders. These rates, which include other diagnoses besides the four diagnoses examined in this analysis, are much smaller than the 43%

pre-disaster prevalence rate in this population (Table 9). Of interest, when the analysis was expanded to include post-disaster disorders as well, the rate rose to 54%.

Ten out of eleven subjects with a previous psychiatric diagnosis experienced diagnosable post-disaster psychopathology, while less than half of those without experienced post-disaster psychopathology. Only two (9%) of the 22 subjects with a pre-disaster diagnosis were free of psychiatric disorder following the disaster, and these two subjects were in the "miss" group. Many individuals without a prior diagnosis developed one after the disaster, but more frequently they remained free of psychiatric disorder, and this held for all subgroups.

Other studies have shown that victims of disaster may have special characteristics (e.g., low socioeconomic status) that predispose them to experiencing a disaster, the same characteristics that predispose to psychiatric disorders (Fergusson and Horwood 1987). Unlike other studies of low-income individuals who were at higher risk of experiencing a disaster (e.g., due to living on a flood plain where land is cheaper, or residing in trailers which are vulnerable to tornado damage) (Smith et al. 1986), characteristics of the population in this study did not put them at risk for experiencing this disaster. The plane crash into the hotel lobby seemed to be a more random event, and it was only by chance that the employees "got in the way".

About one-fifth of the entire sample had previously received psychiatric treatment, and one-third of these subjects had required hospitalization (Table 10). History of psychiatric treatment was equally frequent among on-site and off-site victims, with the highest frequency (29%) in the "miss" group and lowest (8%) the "near-hit" group.

History of previous psychiatric treatment predicted development of one or more post-disaster psychiatric diagnoses in 60% of victims, while 52% of individuals without prior psychiatric treatment developed a post-disaster diagnosis, suggesting that history of psychiatric consultation was not a predictor of development of post-disaster psychopathology. This may well be due to the high frequency of psychiatric disorders.

About two-thirds of the entire sample took advantage of the group counseling offered by NOVA after the disaster, with those on-site at the time of the crash more often participating. Most counseling participants felt that it had been very helpful, and many stated that they would have liked more sessions, especially individual sessions. Most of those who wanted further counseling said they didn't get it because they couldn't afford it. Seventeen percent of the victims did seek professional help (psychiatrist or other mental health professional) in the wake of the disaster (Table 10); however, these individuals did not always represent the same individuals who had sought psychiatric treatment in the past. Treatment-seekers were fairly evenly divided among those who sought treatment before the disaster, after the disaster, and both before and after.

Coping. Information on coping was obtained from subjects who reported feeling upset after the disaster. An overwhelming majority of survivors reported that they depended on family or friends to help them cope with their feelings. But for most, this was not enough, and they turned elsewhere for additional assistance. About one-fourth turned to one of each of the following methods to cope: medication, alcohol, or a health professional (Table 11). Almost two-thirds coped by utilizing medication, alcohol, or the services of a physician or counselor (not shown). Of the 28% who admitted to using alcohol to cope with their feelings about the disaster, two-thirds met

lifetime criteria for alcohol abuse, and half were actively abusing alcohol after the disaster (not shown). All but one of these alcohol abusers met criteria for dependence, either currently or in the past; half were currently dependent. Females represented almost half of those using alcohol to cope, but only one-third of all those abusing alcohol (not shown).

Respondents generally felt that what helped more than anything was the support they received from family and friends. Most felt that talking about their experiences helped them resolve their feelings. Many reported that sharing their experiences and feelings with fellow co-workers who had been through the same thing was invaluable, and that others who hadn't been there couldn't understand or provide support in the way that their comrades could. They often reported that their families and friends didn't want to listen to them, and they welcomed the opportunity to talk to a listening ear as part of participating in this research project. A minority did not want to talk about the disaster at all, stating they felt that they coped best by trying to forget about it and getting on with their lives.

Several individuals coped by focusing their energies on helping to support their fellow victims. Many stories of altruism came to light in these interviews, and some subjects reported that they drew strength from helping others. They developed telephone support networks among themselves, and helped each other find jobs and housing. Many reported that their experience had strengthened or "proved" their religious faith. Subjects commonly reported that they had experienced a sharp change in their values since the disaster: they appreciated each day in their lives in a way that they hadn't before; they placed more value on their families and less on material things. For example, subjects said they now made a point of telling their spouses frequently that they loved them, and they could not leave for work unless they



had kissed all their children. Many were making every effort to spend as much time as possible with their families and to "not take them for granted" anymore.

### CONCLUSIONS

The findings of our preliminary data analysis suggest that after a disaster with strong elements of terror and horror, survivors experience high rates of subjective upset correlated with objective evidence of psychopathology, often in a dose-response pattern. One fourth of the victims had developed a disorder that they had never experienced prior to the disaster; this frequency was highest (over half) in the on-site group, and lowest in the off-site group. Clearly, propensity to develop a diagnosable psychiatric condition was dose-related according to degree of direct exposure to the disaster experience. For PTSD and generalized anxiety disorder, degree of psychiatric impact appeared to be dose-related to the victims' degree of exposure to the disaster. Other factors unrelated to exposure appeared to play a more prominent role in the post-disaster experience of depression and alcohol abuse/dependence.

The apparent dose-response relationship of PTSD and generalized anxiety disorder would tend to support a hypothesis that the occurrence of these disorders may be closely tied to the elements of terror and horror, which may be important contributors to the severity of a traumatic disaster. Depressive disorders are perhaps more closely tied to other related factors such as bereavement over loss of loved ones who died in the disaster, or guilt over having survived.

For depression, pre-existing cases predicted recurrence or persistence, with all prior episodes recurring after the disaster. Cases of PTSD tended to arise de novo after the disaster without a pre-disaster history, especially in

the high-exposure group. Even in those individuals who did not meet criteria for any of the four major psychiatric disorders, evidence of stress was apparent in their high frequencies of symptom reporting (e.g., a mean of four PTSD symptoms per subject), and the symptoms appeared in a dose-response relationship to level of exposure.

The apparent unmet needs of the disaster survivors in the sample were expressed in their uniformly high rate of turning to external methods of coping beyond what family and friends could provide -- i.e., the utilization of medications, alcohol, or services of a health professional by 63%. Half of those using alcohol to cope met criteria for current alcohol abuse, and half of these were physically dependent on it. Respondents generally felt that disaster counseling was useful, and many felt in need of further help but could not afford it.

#### IMPLICATIONS FOR FUTURE RESEARCH

The findings here are not an end-point; they represent a starting point for future research. Although the finding that post-disaster psychopathology occurs in relatively high frequency and in a dose-response relationship is important, further follow-up studies tracing the course of symptoms and the process of recovery over time will be equally important. And although the discovery that perceived harm by the disaster and pre-existing psychopathology are important predictors of post-disaster outcome in the acute phase is also important, further follow-up studies showing predictors of long-term outcome will be of considerable usefulness. Workers who design future intervention programs will need this information in order to tailor their programs to the specific needs of those at highest risk. Since 100% of pre-disaster depression and almost half of pre-existing alcohol disorders tend to recur or persist, perhaps disaster workers could target victims with such a history to

focus their resources on those at highest risk. In fact, almost two-thirds of survivors who will have an acute post-disaster psychiatric disorder can be predicted by identifying those who had a pre-disaster psychiatric history. At follow-up it will be possible to ascertain which forms of intervention have been associated with the best outcomes.

Since systematic disaster research is still in the early stages, many questions remain about the best way to go about designing research studies. A crucial issue is that of timing of interviews. Too much delay in getting into the field initially may miss symptoms that occur in the early phases following a disaster; also, victims may be less inclined to discuss their experiences and feelings as time goes by. It is not clear when is the best time to return to the field for follow-up interviews, since few systematic studies have utilized periodic reassessment. Frequent re-interviews of the same subjects would create additional problems in the methodology by contaminating subjects' recollection of events and symptoms and reducing their cooperation.

Ideally, a systematic, larger scale effort needs to be made which would allow re-interview of portions of the sample at staggered intervals. This would establish optimum intervals for researchers to follow up their subjects. In the end, such improvements in research methodology will increase understanding of the psychological consequences of a disaster and illustrate the course of recovery.

## REFERENCES

- Cloninger CR. (1986) Tridimensional Personality Questionnaire. St. Louis, MO: Washington University School of Medicine
- Fergusson DM and Horwood LS. (1987) Vulnerability to Life Events Exposure 17: 739-749.
- Horowitz M, Wilner N, and Alvarez W. (1979) Impact of Events Scale: A measure of subjective distress. *Psychosomatic Medicine* 41 (3): 209-218.
- Robins LN and Smith EM. (1983) The Diagnostic Interview Schedule/Disaster Supplement. St. Louis, MO.: Washington University School of Medicine.
- Robins LN, et al. (1984) Lifetime Prevalence of Specific Psychiatric Disorders in Three Sites, *Arch Gen Psych*, 41: 949-958.
- Smith EM, Robins LN, Przybeck TR, et al. (1986) Psychosocial consequences of a disaster. In J.H. Shore (Ed.), Disaster Stress Studies: New Methods and Findings (pp. 50-76). Washington, D.C.: American Psychiatric Press, Inc.

Table 1. Demographics

	<u>On-site</u> (N=17)	<u>Near-hit</u> (N=12)	<u>Miss</u> (N=17)	<u>All</u> (N=46)
<u>Sex</u>				
Male	5 (29%)	5 (42%)	7 (41%)	17 (37%)
Female	12 (71%)	7 (58%)	10 (59%)	29 (63%)
<u>Race</u>				
White	16 (94%)	10 (83%)	16 (94%)	42 (91%)
Black	1 (6%)	2 (17%)	1 (6%)	4 (9%)
<u>Age groups</u>				
<25	5 (29%)	3 (25%)	8 (47%)	16 (35%)
25-44	10 (59%)	7 (58%)	6 (35%)	23 (50%)
45-64	2 (12%)	2 (17%)	3 (18%)	7 (15%)
Mean age (years)	30.1	29.7	28.1	29.2
<u>Marital Status</u>				
Married	13 (76%)	3 (25%)	4 (24%)	20 (43%)
Divorced/ Separated	0	3 (25%)	3 (18%)	6 (13%)
Single	4 (24%)	6 (50%)	9 (53%)	19 (41%)
Widowed	0	0	1 (6%)	1 (2%)
<u>Education</u>				
HS grad or GED	11 (65%)	10 (83%)	9 (53%)	30 (65%)
Some college	1 (6%)	5 (42%)	4 (24%)	10 (22%)
Mean (Years)	11.6	12.8	11.5	11.8

Table 2. Perceived upset, harm, and degree of recovery

	<u>On-site</u> (N=17)	<u>Near-hit</u> (N=12)	<u>Miss</u> (N=17)	<u>All</u> (N=46)
<u>Upset</u>				
Very	17 (100%)	11 (92%)	10 (59%)	38 (83%)
Somewhat	0	0	4 (24%)	4 (9%)
Not very	0	0	2 (12%)	2 (4%)
No info.	0	1 (8%)	1 (6%)	2 (4%)
<u>Harm</u>				
Great deal	12 (71%)	6 (50%)	9 (53%)	27 (59%)
Not much	5 (29%)	6 (50%)	8 (47%)	19 (41%)
<u>Recovery</u>				
Full	2 (12%)	3 (25%)	7 (41%)	12 (26%)
Partial	8 (47%)	7 (58%)	9 (53%)	24 (52%)
None	7 (41%)	2 (17%)	1 (6%)	10 (22%)

Table 3. Subjects with one or more psychiatric diagnoses\* after the disaster (prevalence versus incidence)

<u>Subjects with one or more diagnosis</u>	<u>On-Site (N=17)</u>	<u>Near hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
All cases after disaster (prevalence)	10 (59%)	7 (58%)	8 (47%)	25 (54%)
New cases since disaster (incidence)	9 (53%)	4 (33%)	2 (12%)	15 (33%)

\* Includes PTSD (by DSM-III criteria), alcohol abuse/dependence, depression, and generalized anxiety disorder.

Table 4. PTSD Symptoms

<u>PTSD Symptom</u>	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
dreams/ recollection	16 (94%)	9 (75%)	8 (47%)	33 (72%)
happening again	10 (59%)	4 (33%)	1 ( 6%)	15 (33%)
numbness	5 (29%)	3 (25%)	3 (18%)	11 (24%)
jumpy	14 (82%)	6 (50%)	3 (18%)	23 (50%)
insomnia	15 (88%)	6 (50%)	9 (53%)	30 (65%)
survivor guilt	7 (41%)	2 (17%)	4 (24%)	13 (28%)
concentration	10 (59%)	6 (50%)	6 (35%)	22 (48%)
avoid reminders	11 (65%)	4 (33%)	8 (47%)	23 (50%)
reminders make worse	12 (71%)	7 (58%)	3 (18%)	22 (48%)
mean number of symptoms	5.88	3.92	2.65	4.17
subjects with ≥ 1 symptom	17 (100%)	10 (83%)	9 (53%)	35 (76%)



Table 5. Post-disaster rates of PTSD diagnosis by DSM-III versus DSM-IIIR criteria

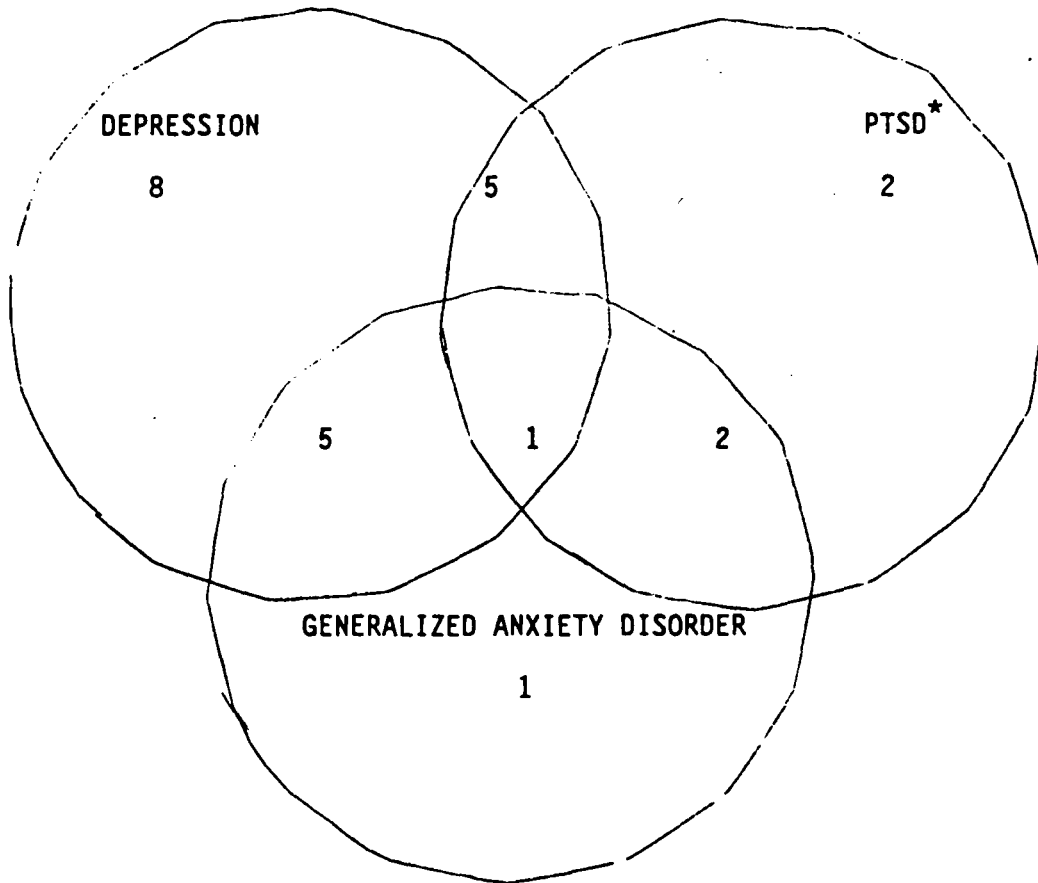
<u>Rates of PTSD Diagnosis</u>	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
By DSM-III criteria	5 (29%)	2 (17%)	3 (18%)	10 (22%)
By DSM-IIIR criteria	9 (53%)	3 (25%)	3 (18%)	15 (33%)

Table 6. Rates of Psychiatric Diagnosis

All cases since disaster (Prevalence)				
<u>Diagnosis</u>	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
PTSD*	5 (29%)	2 (17%)	3 (18%)	10 (22%)
Alcohol abuse/ dependence	2 (12%)	2 (17%)	2 (12%)	6 (13%)
Depression	7 (41%)	6 (50%)	6 (35%)	19 (41%)
Generalized anxiety disorder	5 (29%)	2 (17%)	2 (12%)	9 (20%)
New Cases Since Disaster (Incidence)				
	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
PTSD*	5 (29%)	1 (8%)	1 (6%)	7 (15%)
Alcohol abuse/ dependence	2 (12%)	0	0	2 (4%)
Depression	4 (24%)	3 (33%)	2 (12%)	9 (20%)
Generalized anxiety disorder	3 (18%)	2 (17%)	0	5 (11%)
Diagnosis Present Before and After Disaster (Persistence)				
	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
PTSD*	0	1 (8%)	2 (12%)	3 (7%)
Alcohol abuse/ dependence	0	2 (17%)	2 (12%)	4 (9%)
Depression	3 (18%)	3 (25%)	4 (24%)	10 (22%)
Generalized anxiety disorder	2 (12%)	0	2 (12%)	4 (9%)

\*Diagnosis made by DSM-III criteria.

Table 7. Overlap of Post-disaster Disorders (Prevalence)



Subjects were counted as positive if they had either a new onset of a recurrence of depression, PTSD, or generalized anxiety disorder.

\* Diagnosis made with DSM-III criteria.

Table 8. Relationship of number of post-disaster diagnoses\* to subjective reports of harm and recovery

Harm

	<u>No diagnosis</u>	<u>≥1 diagnosis</u> *
Not much	11 (73%)	8 (26%)
Great deal	4 (27%)	23 (74%)
Total	15 (100%)	31 (100%)

Recovery

	<u>No diagnosis</u>	<u>≥1 diagnosis</u> *
Full	5 (33%)	7 (23%)
Partial	10 (67%)	14 (45%)
None	0	10 (32%)
Total	15 (100%)	31 (100%)

\* includes PTSD (by DSM-III criteria), depression, generalized anxiety disorder, and alcohol abuse/dependence.

Table 9. Current psychiatric diagnoses\* versus prior psychiatric diagnoses

		# prior diagnoses*		
		0	>1	
<u>All</u>				
# current diagnoses*	0	13	2	15
	>1	11	20	31
		24	22	46
 <u>On-site</u>				
# current diagnoses*	0	2	0	2
	>1	9	6	15
		13	6	17
 <u>Off-site</u>				
# current diagnoses*	0	11	2	13
	>1	2	14	16
		13	16	29

\* includes PTSD (by DSM-III criteria), depression, generalized anxiety disorder, and alcohol abuse/dependence.

Table 10. Treatment

<u>Psychiatric Treatment</u>	<u>On-site (N=17)</u>	<u>Near-hit (N=12)</u>	<u>Miss (N=17)</u>	<u>All (N=46)</u>
Pre-disaster treatment	4 (24%)	1 (8%)	5 (29%)	10 (22%)
Pre-disaster hospitalization	1 (6%)	0	2 (12%)	3 (7%)
Current treatment*	4 (24%)	0	4 (24%)	8 (17%)

\* Refers to treatment by psychiatrist or other mental health professional.

Table 11. Coping

<u>Method of Coping</u>	<u>On-site (N=16)</u>	<u>Near-hit (N=10)</u>	<u>Miss (N=14)</u>	<u>All (N=40)</u>
Friends/Family	16 (100%)	10 (100%)	9 (64%)	35 (88%)
Medication	6 (38%)	2 (20%)	3 (21%)	11 (28%)
Alcohol	6 (38%)	3 (30%)	2 (14%)	11 (28%)
Doctor <sup>*</sup> /Counselor	7 (44%)	2 (20%)	1 (7%)	10 (25%)
Other	16 (100%)	2 (20%)	6 (43%)	24 (60%)

\* Doctor refers to medical doctor or other health professional or counselor.