

# Post-Disaster Mental Health Problems and the Utilization of Mental Health Services: A Four-year Longitudinal Comparative Study

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This study examined mental health problems and mental health services (MHS) utilization after a fireworks disaster among adult survivors and a comparison group. The disaster took place on May 13, 2000, in the city of Enschede, The Netherlands. Victims ( $N=662$ ) participated in a survey 2–3 weeks (T1), 18 months (T2) and 4 years (T3) post-disaster. The comparison group consisted of non-affected people from another city ( $N=526$ ). They participated at T2 and T3. Victims used MHS more often than the comparison group in the 12-month period before T2 and T3 (OR 3.9 and 2.4). Victims with severe depression and anxiety symptoms at T2 used MHS more often than participants in the comparison group with these symptoms (OR 2.6 and 2.0). After 4 years, MHS utilization among participants in both groups with anxiety symptoms did not differ, suggesting attenuation of the observed effects. Results suggest that after a disaster survivors with mental health problems are less reluctant to use MHS than under normal circumstances.

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**KEY WORDS:** anxiety; depression; disaster; mental health services; post-traumatic stress disorder.

## INTRODUCTION

An extensive body of research has shown that many, but certainly not all, adult victims of disasters suffer from mental health problems, such as depression and anxiety symptoms, intrusions and avoidance reactions, physical symptoms and fatigue

in either the short or long term. Mental health problems decline over time, although a minority of survivors suffers from persistent mental health disturbances, such as post-traumatic stress disorder (Galea, Nandi, & Vlahov, 2005; Norris et al., 2002; Rubonis & Bickman, 1991).

Relatively few studies have documented the utilization of mental health services (MHS) among adult survivors of a disaster (Boscarino, Adams, & Figley, 2004a; Van der Velden et al., 2005). Their findings showed that MHS utilization rates during the first 6–12 months varied in range between 2.7% Goto, Wilson, Kahana, & Slane (2002) and 38% (Sprang, 2001).

MHS utilization after disasters, or after other traumatic events, depends on the severity of post-disaster mental health problems (Elhai, North, & Frueh, 2005). However, very few disaster studies

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examined the *relation* between mental health problems and MHS utilization. Boscarino and his colleagues systematically investigated this relation in a series of studies during the first year after the 9/11 terrorist attacks in New York (Boscarino, Galea, Ahern, Reisman, & Vlahov, 2002; Boscarino et al., 2004a; 2004b; Boscarino, Adams, Stuber, & Galea, 2005). They found that post-disaster PTSD and anxiety independently predicted MHS visits related to the attacks during the first year (Boscarino et al., 2004a). Of the participants in their study with PTSD or major depression, 45.1% had used MHS in the first year (Boscarino et al., 2005). Livanou et al. (2002) and Şalcioğlu et al. (2003) examined relocated treatment and non-treatment-seeking survivors of an earthquake in Turkey. Results showed that 39% of the relocated survivors who did not seek treatment had PTSD 20 months post-disaster. Among treatment-seeking survivors, 63% had PTSD 14 months post-disaster (i.e. 6 months earlier than the previous study showed).

These findings suggest that societal differences (e.g. Bijl et al., 2003) play an important role in MHS utilization after a disaster and that many survivors with severe mental health problems do not seek treatment or wait to seek treatment (e.g. Kessler, Olfson, & Gerlund, 1998). Yet it is unknown if there are differences in MHS utilization among survivors and a comparable group of non-affected people. To our knowledge, there are no comparative longitudinal studies available that have assessed post-disaster MHS utilization in the long term (Van der Velden et al., 2005). However, insight in treatment-seeking behavior among survivors compared to MHS utilization among non-affected people is essential for preparing mental health policies for future disasters. Public health organizations need information about the number of survivors that will seek treatment in excess of normal MHS utilization by the general population.

The goal of the current comparative study is to fill this gap in information. In this context, our main research questions are: To which extent did affected residents use MHS more often than non-affected people during the first 4 years after the disaster? Were there any differences in MHS utilization between affected and non-affected residents with the same mental health problems? Did affected residents who used MHS have more mental health problems than affected residents who did not use MHS?

## METHODS

### Background

On May 13, 2000 a disaster occurred in the city of Enschede (152,000 inhabitants), The Netherlands, near the Dutch border with Germany. The disaster started with exploding fireworks at 2:24 pm on Saturday in a fireworks storage and trade company. At 3:22 pm one of the concrete bunkers for fireworks storage caught fire and at 3:35 pm a massive and fatal explosion occurred. The explosion destroyed the central storage facility and caused the explosion of several metal containers with fireworks. The company was located in the middle of a residential area and the disaster severely damaged or destroyed approximately 500 houses due to either fire or air pressure from the explosion. As a consequence 19 residents and 4 firefighters were killed and over 900 people were injured (Commissie Onderzoek Vuurwerkkramp Enschede, 2001).

The Dutch government declared it a national disaster. A special Aftercare Unit was set up to provide MHS and trauma-related treatment for the affected residents. In Enschede, much public attention was given to the existence of this unit. Through public campaigns, affected residents with mental health problems were encouraged to seek treatment. The Dutch Ministry of Health, Welfare and Sports decided to launch a comprehensive health surveillance (Roorda, Van Stiphout, & Huijsman-Rubingh, 2004).

### The Surveys

Part of this health surveillance is the Enschede Fireworks Disaster Study (Van Kamp et al., 2005; Van der Velden et al., 2005). At 2 to 3 weeks post-disaster (T1), affected residents were asked by mail to participate. They lived in the residential area where the disaster took place. In addition, announcements were made in the press to encourage affected residents to participate. Part of the first survey was the collection of blood and urine samples to analyze fireworks-related chemical elements. In November–December 2001 (18 months post-disaster: T2) and January–February 2004 (almost 4 years post-disaster: T3), participants who gave their written informed consent at T1 or T2 were asked to participate again.

The present report is based on a cohort of 662 affected residents of Dutch origin who participated in all three surveys (at T1 1083 residents participated; estimated response = 32.8%). At T2, out of 1071 residents who could be asked to participate (12 migrated, died or their address was unknown) 861 residents participated (response = 80.4%). At T3, out of 995 residents who could participate, 757 did (response = 76.1%). Non-response analyses showed negligible differences in health problems at T1, T2 and T3 between the 662 affected residents and the total group of affected residents who participated at T1, or T2 or T3. For example, 45.7% of the affected residents in this study ( $N = 662$ ) had depression symptoms at T1. Of the total group of respondents at T1 ( $N = 1083$ ), 46.3% had these symptoms. Of all respondents at T2 ( $N = 871$ ), 30.6% had these symptoms versus 30.4% of the participants in this study. With respect to T3, 25.4% of all respondents at T3 ( $N = 757$ ) reported depression symptoms versus 25.6% of the participants in this study.

Due to time constraints, we were unable to arrange a comparison group at the time of the first survey. The comparison group was included at T2 and was based on a sample drawn from the Registry Office in a comparable (in composition of the population and in general health status) residential area in the city of Tilburg. Tilburg is located in another part of the Netherlands, at 112 miles distance from Enschede. The comparison sample was stratified on gender, age category and country of origin. For the present study, we analyzed the data of respondents that participated at T2 (1138 residents were asked to participate and 694 responded, response = 61.0%) and at T3 (670 could participate and 526 did, response = 78.5%). Non-response analyses showed negligible differences in health problems at T2 between respondents in the comparison group who participated at T2 and T3, and the total group of participants at T2. For example, 22.2% of the comparison group in this study ( $N = 526$ ) had depression symptoms at T2, whereas of the total group of respondents at T2 ( $N = 649$ ), 22.1% reported these symptoms.

The Medical Ethical Testing Committee (TNO-Zeist, the Netherlands) approved the three study protocols. Participants received a 12 euro (15 US dollar) token gift at the second and third survey.

## Measures

Participants filled in a comprehensive questionnaire including an informed consent form at T1, T2 and T3. At T1, damage to the home and experiences during or immediately after the disaster were investigated (for example: saw the explosion, felt the air pressure due to the explosion, or felt intense fear). At T3, 19 life events were assessed, such as death of partner, divorce, traffic accident, assault, sexual abuse and robbery (Van der Velden, Van der Burg, Steinmetz, & Van den Bout, 1992). Items were scored on a 6-point Likert scale (1 = not at all to 6 = during past 6 months). For the present study, a distinction was made between participants who did or did not experience one or more events in the period 0–2 years before T3 and 2–5 years before T3 (1 = no, 2 = yes).

Depression and anxiety symptoms were measured at T1, T2 and T3 using the Dutch version of the SCL-90-R (Arrindell & Ettema, 1986, 2003; Derogatis, 1979). Items have a 5-point Likert scale (1 = not at all to 5 = extremely) and assess the degree of symptoms over the past 7 days. To identify participants with severe anxiety and depression symptoms (1 = no, 2 = yes), the Dutch cut-off scores for high or very high scores from a normal population were used (i.e. scores in or above the eighth decile; Arrindell & Ettema, 1986). The cut-off scores for the depression scale (16 items) were: for females  $\geq 28$  and for males  $\geq 23$ . For the anxiety scale (10 items) the cut-off scores for females and males were  $\geq 18$  and  $\geq 15$ , respectively. At all assessment moments, the internal consistencies of both subscales in both groups were excellent ( $\alpha \geq .91$ ).

Mental health services utilization (Aftercare Unit, local mental health organizations, private psychiatrist, psychologist, and psychotherapist) was assessed at T2 and T3. All participants were asked if they had had any contact with MHS in the year before the survey (1 = no, 2 = yes). If they had, we assessed whether they were still in treatment at the time of the survey (1 = no, 2 = yes). Furthermore, at T3 we asked participants if they had had any contact with MHS in the period May 13 2000 to January–February 2004.

To assess disaster-related intrusions and avoidance reactions at T1, T2 and T3 in the affected residents the Dutch version of the Impact of Event Scale was applied (IES: Brom & Kleber, 1985;

Horowitz, Wilner, & Alvarez, 1979; Van der Ploeg, Mooren, Kleber, Van der Velden, & Brom, 2004). Scores on the 15 items of the IES were rated on a 4-point Likert scale (0 = not at all to 5 = often) and assessed the degree of disaster related intrusions and avoidance reactions over the past 7 days. A cut-off score of 25 ( $> 25$ ) was used to identify survivors with relatively severe intrusions and avoidance reactions (1 = no, 2 = yes; according to Başoğlu, Şalcioğlu, & Livanou, 2002; Carr et al., 1997; Chemtob, Tomas, Law, & Cremniter, 1997; Van der Velden et al., 1992). At all measurements, the internal consistencies were excellent ( $\alpha \geq .94$ ).

The self-rating-scale Posttraumatic Stress Disorder (SRS-PTSD; Carlier, Van Uchelen, Lamberts, & Gersons, 1998) was applied at T2 and T3, to assess disaster related PTSD during the last 4 weeks (based the criteria of DSM IV). The SRS-PTSD was not applied at T1 because PTSD can, by definition, only be diagnosed after one month. Items of intrusions (5 items), avoidance reactions (7 items) and hyper-arousal symptoms (5 items) were rated on several 3-point Likert scales (for example 1 = not at all to 3 = 4 times or more per week; 1 = not at all to 3 = extremely). A person had PTSD if he or she met the criteria of intrusions (at least 1 out of 5 items), and the criteria of avoidance reactions (at least 3 out of 7 items) and the criteria of hyper-arousal symptoms (at least 2 out of 5 items). Internal consistencies of the SRS-PTSD at T2 and T3 were excellent ( $\alpha \geq .89$ ). In a recent review of screening instruments for adults at

risk for PTSD, Brewin (2005) concluded that the SRS-PTSD demonstrated a good balance between sensitivity and specificity, with high levels of both.

## Analyses

For comparisons between both groups with respect to demographic characteristics, chi-square tests were conducted. Differences in MHS utilization and mental health problems between both groups were examined by odd ratios (OR) and 95% confidence intervals (CI). The course of mental health problems was examined by using McNemar chi-square tests. To assess differences in MHS utilization among participants in both groups with mental health problems, OR and 95% CI intervals were calculated. Odd ratios and confidence intervals were obtained via logistic regression analyses. SPSS statistical software package (version 12.0) was used to perform statistical analyses.

## RESULTS

### Characteristics of Affected Residents and Comparison Group

The sample characteristics of the affected residents and the comparison group at T2 are presented in Table 1. The groups did not differ in demographic characteristics or reported life events.

**Table 1.** Sample Characteristics of Affected Residents ( $N = 662$ ) and Comparison Group ( $N = 526$ )

|  | Affected residents<br><i>n</i> (% in sample) | Comparison group <sup>a</sup><br><i>n</i> (% in sample) | $\chi^2$ | df | <i>p</i> |
|--|--|---|----------|----|----------|
| Males                                  | 282 (42.7)                                   | 233 (44.3)  | .29      | 1  | ns       |
| Age                                    |  |   |          |    |          |
| 18–24                                  | 48 (7.3)                                     | 55 (10.5)   | 4.87     | 3  | ns.      |
| 25–44                                  | 285 (43.2)                                   | 226 (43.0)  |          |    |          |
| 45–64                                  | 245 (37.1)                                   | 192 (36.5)  |          |    |          |
| 65+                                    | 82 (12.4)                                    | 53 (10.1)   |          |    |          |
| Educational level                      |  |   |          |    |          |
| Primary school                         | 63 (10.3)                                    | 56 (10.9)   | 1.54     | 3  | ns.      |
| Junior high                            | 209 (34.3)                                   | 191 (37.2)  |          |    |          |
| Senior high/professional education     | 204 (33.4)                                   | 164 (32.0)  |          |    |          |
| High professional education/university | 134 (22.0)                                   | 102 (19.9)  |          |    |          |
| Having paid job                        | 373 (56.3)                                   | 320 (60.8)  | 2.43     | 1  | ns.      |
| Single                                 | 92 (13.9)                                    | 60 (11.4)   | 1.63     | 1  | ns.      |
| Life events 2–5 years before T3        | 295 (44.6)                                   | 220 (41.8)  | .21      | 1  | ns.      |
| Life events 0–2 years before T3        | 365 (55.1)                                   | 297 (56.5)  | .21      | 1  | ns.      |

ns, Not significant.

<sup>a</sup>Participants in the comparison were residents of the city of Tilburg, which is located in another part of the Netherlands.

Of the affected residents who participated in the three surveys, 20.1% reported severe damage or total destruction of their homes, 75.6% saw the explosion, 74.0% felt the air pressure due to the explosion, 60.4% reported intense fear, 65.1% saw wounded victims and 21.6% severely wounded victims, 8.3% saw residents killed, 37.8% experienced a pounding heart, 43.5% heard the screaming of children during or immediately after the disaster (data not shown in table).

### Mental Health Problems and Mental Health Services Utilization

The mental health problems and MHS utilization among the affected residents and the comparison group are shown in Table 2. Health problems of the affected residents declined significantly from T1 to T2 and from T2 to T3 (all McNemar-tests,  $p < .001$ ). Rates of severe depression and anxiety symptoms, as well as intrusions and avoidance reactions among the affected residents, diminished

more rapidly in the period T1–T2 (time interval 18 months) than in the period T2–T3 (time interval approximately 26 months). Within the comparison group the percentages of severe depression and anxiety symptoms did not change significantly (all McNemar-tests, ns.). Four years after the disaster, 9.7% of the affected residents had PTSD according to the SRS-PTSD and 23.7% reported strong intrusions and avoidance reactions.

Table 2 shows that the affected residents reported more severe depression and anxiety symptoms at T2 than the comparison group. Affected residents also had more persistent (present at T2 and T3) depression and anxiety symptoms than the comparison group. Affected residents used MHS more often in the 12-month period before T2 and T3 and in the past four years than the comparison group.

Our data showed that at the time of the second survey (14.2% versus 4.7%: OR 3.39, 95% CI: 2.13–5.41) and third survey (9.6% versus 4.3%: OR 2.34, CI: 1.42–3.86), the affected residents were more likely to still be in treatment than the comparison group.

**Table 2.** Mental Health Problems and the Utilization of MHS Among Affected Residents ( $N = 662$ ) and Comparison Group ( $N = 526$ )

|                                    | Affected residents<br><i>n</i> (% in sample) | Comparison group <sup>a</sup><br><i>n</i> (% in sample) | OR   | 95% CI    |
|------------------------------------|--|---|------|-----------|
| Depression symptoms                |  |   |      |           |
| At T1                              | 283 (45.4)                                   | n.a.  |      |           |
| At T2                              | 195 (30.4)                                   | 116 (22.2)  | 1.53 | 1.17–2.00 |
| At T3                              | 163 (25.3)                                   | 108 (20.9)  | 1.26 | 0.98–1.70 |
| At T2 and T3 (persistent)          | 111 (17.7)                                   | 67 (13.0)   | 1.44 | 1.03–1.99 |
| Anxiety symptoms                   |  |   |      |           |
| At T1                              | 266 (41.8)                                   | n.a.  |      |           |
| At T2                              | 170 (26.5)                                   | 61 (11.7)   | 2.73 | 1.98–3.75 |
| At T3                              | 125 (19.3)                                   | 75 (14.5)   | 1.42 | 1.04–1.93 |
| At T2 and T3 (persistent)          | 89 (14.1)                                    | 41 (7.9)  | 1.91 | 1.29–2.82 |
| Intrusions and avoidance reactions |  |   |      |           |
| At T1                              | 447 (70.6)                                   | n.a.  |      |           |
| At T2                              | 232 (36.8)                                   | n.a.  |      |           |
| At T3                              | 150 (23.7)                                   | n.a.  |      |           |
| At T2 and T3 (persistent)          | 116 (19.0)                                   | n.a.  |      |           |
| PTSD                               |  |   |      |           |
| At T2                              | 87 (13.4)                                    | n.a.  |      |           |
| At T3                              | 63 (9.7)                                     | n.a.  |      |           |
| At T2 and T3 (persistent)          | 39 (6.1)                                     | n.a.  |      |           |
| Use of Mental Health Services      |  |   |      |           |
| In the 12 months preceding T2      | 175 (27.6)                                   | 46 (9.0)  | 3.90 | 2.75–5.52 |
| In the 12 months preceding T3      | 116 (17.9)                                   | 42 (8.3)  | 2.42 | 1.66–3.52 |
| From May 13 2000 until T3          | 294 (45.0)                                   | 90 (17.2)   | 3.94 | 2.99–5.18 |

Notes: n.a. = not available; T1 = 2–3 weeks post-disaster; T2 = 18 months post-disaster; T3 = almost 4 years post-disaster.  
<sup>a</sup>Participants in the comparison were residents of the city of Tilburg, which is located in another part of the Netherlands.

### Use of Mental Health Services Among Participants With Mental Health Problems

Among the affected residents with severe depression symptoms, anxiety symptoms or intrusions and avoidance reactions 2–3 weeks post-disaster 39.1, 42.8 and 32.5%, respectively, had had contact with MHS in the 6 to 18 months after the disaster (data not shown in table).

MHS utilization among the participants in both groups with current or persistent depression and anxiety symptoms are presented in Table 3. Before the odds ratios were calculated, we first analyzed if both subgroups had equal mean scores on the SCL-90-R depression and anxiety scales. Results showed that both subgroups did not differ in mean scores at T2 [anxiety:  $t(89.6) = .62$ , ns.; depression:  $t(299) = -.57$ , ns.], nor at T3 [anxiety:  $t(198) = -1.16$ , ns.; depression:  $t(269) = -.71$ , ns.].

As can be seen in Table 3, affected residents with severe anxiety or depression symptoms at T2 had had contact with MHS in the 12-month period before T2 more often than participants in the comparison group with these symptoms. Affected residents with depression symptoms at T3 were twice as likely to have contact with MHS in the preceding 12-month period than participants in the comparison group. Affected residents and participants in the comparison group with severe anxiety symptoms did

not differ significantly at T3 in MHS utilization in the 12-month period before T3. We found no differences in MHS utilization in the 12-month period before the last survey between participants from both groups with persistent depression or anxiety symptoms (see Table 3).

Of the residents with persistent depression symptoms and anxiety symptoms, 70.9% and 71.8% respectively had used MHS in the past 4 years. Affected residents with depression symptoms at T2 were more likely to still be receiving treatment than participants in the comparison group with these symptoms (31.7% versus 18.6%, OR 2.04, CI: 1.16–3.58; data not shown in table).

MHS utilization among the affected residents with current or persistent intrusions and avoidance reactions and PTSD (IES and SRS-PTSD was only applied to the affected residents) are presented in Table 4. A minority of the affected residents with current or persistent intrusions and avoidance reactions had used MHS in the 12-month period before T2 and T3. Of the affected residents with PTSD, the majority had used MHS in the 12-month period before T2. A large majority of the affected residents with persistent PTSD (89.7%) had had contact with MHS in the period May 2000 to January–February 2004. Nearly two-thirds of the affected residents with persistent intrusions and avoidance reactions had used MHS in that period.

**Table 3.** The Use of Mental Health Services (MHS) Among Affected Residents and Comparison Group with Depression and Anxiety Symptoms

|   | Affected residents<br><i>n</i> (% in sample with symptoms) | Comparison group <sup>a</sup><br><i>N</i> (% in sample with symptoms) | OR   | 95% CI    |
|---|--|---|------|-----------|
| <b>Depression symptoms</b>  |  |   |      |           |
| MHS utilization in 12 months preceding T2 among participants with depression symptoms at T2                   | 96 (50.8)  | 32 (28.3)   | 2.61 | 1.59–4.30 |
| MHS utilization in 12 months preceding T3 among participants with depression symptoms at T3                   | 58 (36.0)  | 23 (21.7)   | 2.03 | 1.16–3.57 |
| MHS utilization in 12 months preceding T3 among participants with persistent <sup>b</sup> depression symptoms | 43 (38.7)  | 20 (30.3)   | 1.45 | 0.76–2.78 |
| <b>Anxiety symptoms</b>   |  |   |      |           |
| MHS utilization in 12 months preceding T2 among participants with anxiety symptoms at T2                      | 84 (50.6)  | 22 (33.9)   | 2.00 | 1.08–3.71 |
| MHS utilization in 12 months preceding T3 among participants with anxiety symptoms at T3                      | 47 (38.2)  | 19 (25.7)   | 1.79 | 0.95–3.38 |
| MHS utilization in 12 months preceding T3 among participants with persistent <sup>b</sup> anxiety symptoms    | 35 (39.3)  | 11 (26.8)   | 1.77 | 0.79–3.98 |

Notes. T2 = 18 months post-disaster; T3 = Almost 4 years post-disaster.

<sup>a</sup>Participants in the comparison were residents of the city of Tilburg, which is located in another part of the Netherlands.

<sup>b</sup>Symptoms at T2 and T3.

### Health Problems Among Affected Residents Who Did and Did Not Use MHS

Affected residents who had used MHS in the 12-month period before T2 had more severe depression symptoms (56.1%) at T2 than the affected residents who had not used MHS in this period (20.7%; OR 4.90 95% CI: 3.36–7.16). The same pattern was observed for severe anxiety symptoms (49.1% versus 18.2%, OR 4.33, 95% CI: 2.95–6.40), for intrusions and avoidance reactions (55.9% versus 28.6%, OR 3.16, 95% CI: 2.19–4.55), and for PTSD (28.5% versus 7.3%, OR 5.05, 95% CI 3.11–8.20). Among affected residents who still had contact with MHS at T2, 68.2% had severe depression symptoms, 58% anxiety symptoms, 62.1% strong intrusions and avoidance reactions and 41.6% met the criteria for PTSD.

Our analyses revealed the same differences at T3. Survivors who used MHS in the 12-month period before T3 had more depression symptoms (51.8% versus 19.8%: OR 4.40, 95% CI: 2.84–6.69) and more anxiety symptoms (42.0% versus 14.5%: OR 4.27, 95% CI: 2.73–6.58) than non-MHS users. Furthermore, they reported more intrusions and avoidance reactions (38.4% versus 20.4%: OR 2.43, 95% CI 1.57–3.76) and more PTSD (26.3% versus 6.3%: OR 5.33, 95% CI: 3.09–9.19). Among those who had still contact with MHS at T3, 58.3, 44.1, 37.7 and 29.5%, respectively, had severe depression symptoms, anxiety symptoms, strong intrusions and avoidance reactions, and PTSD.

### DISCUSSION

This is the first comparative longitudinal disaster study that examined the relation between mental health problems (both current and persistent) and

mental health services utilization (MHS). Two to three weeks after the disaster, many affected residents suffered from severe depression (45%) and anxiety symptoms (42%) and particularly from strong intrusions and avoidance reactions (70.6%). According to the criteria of 'the overall severity of impairment' of Norris and her colleagues (2002), the fireworks disaster severely impaired the affected residents (based on the percentage of intrusions and avoidance reactions, the disaster would fall into the category very severe impairment). Consequently, after almost 4 years the affected residents showed more severe anxiety symptoms than the comparison group. The observed decline in mental health problems among victims and our finding that the affected residents had more, and more persistent, severe mental health problems than the comparison group is consistent with previous studies (Galea et al., 2005; Norris et al., 2002; Rubonis & Bickman, 1991).

This study combines two important results. On the one hand, findings showed that the affected residents had used MHS more often than the comparison group in the 12 months before T2 (OR 3.9) and, to a lesser extent (OR 2.4), in the 12 months before T3. Affected residents with severe depression symptoms were more likely to use MHS than participants in the comparison group with depression symptoms. With respect to severe anxiety symptoms, a difference existed only in MHS utilization in the 12-month period before T2. However, we found no differences in MHS utilization between participants in both groups with persistent anxiety and depression symptoms.

How can these two results be explained? In Enschede, much public attention was paid to the existence of the Aftercare Unit for affected residents. Through public campaigns, affected residents with mental health problems were encouraged to seek treatment. These special circumstances may

**Table 4.** The Use of Mental Health Services Among Affected Residents with Intrusions and Avoidance Reactions and PTSD

|   | Intrusions and avoidance reactions<br><i>n</i> (% in sample with reactions) | PTSD<br><i>n</i> (% in sample with PTSD) |
|---|---|--|
| MHS utilization in 12 months preceding T2 among participants with symptoms <sup>a</sup> at T2                   | 95 (43.0)   | 49 (59.8)                                |
| MHS utilization in 12 months preceding T3 among participants with symptoms <sup>a</sup> at T3                   | 43 (29.1)   | 30 (47.6)                                |
| MHS utilization in 12 months preceding T3 among participants with persistent <sup>b</sup> symptoms <sup>a</sup> | 35 (30.7)   | 14 (35.9)                                |

Notes. <sup>a</sup>With intrusions and avoidance reactions/PTSD.

<sup>b</sup>Symptoms at T2 and T3.

have diminished feelings of shame in the affected residents (e.g. Schwarz & Kowalski, 1992) with non-persistent mental health problems to seek help. As far as we know, there are no disaster studies with which to compare our findings.

Like Boscarino et al. (2002, 2004a, 2004b, 2005) we found a strong relation between postdisaster mental health problems and MHS utilization. Of the participants with PTSD or a major depression, 45% had used MHS in the first year after the 9/11 terrorist attacks (Boscarino et al., 2005). In our study, 60% of the participants with PTSD at T2 had used MHS 6–12 months postdisaster. Of the affected residents with persistent PTSD, 90% had had contact with MHS in the past 4 years. These findings suggest that most victims of disasters with severe psychological disturbances seek treatment, albeit in several cases delayed (e.g. Hull, Alexander, & Klein, 2002; Kessler et al., 1998). Additional research is warranted to address the question of why disaster victims with serious mental health problems wait to seek treatment (e.g. Boscarino et al., 2005).

Livanou et al. (2002) and Şalcioğlu et al. (2003) found that 20 months post-disaster, 39% of the relocated survivors who had not used MHS had PTSD. The group of affected residents who did not use MHS in our study had substantially lower levels of severe depression and anxiety symptoms, intrusions and avoidance reactions, and PTSD at T2 and T3 than MHS users had.

Despite the strength of our research, i.e. a comparative longitudinal design, our study does have limitations. We did not include affected children, rescue workers and ethnic minorities in the present study. In general, the use of health services differs across various ethnic groups who are disabled due to psychological distress (Boufous, Silove, Bauman, & Steel, 2005). However, we previously reported that affected ethnic minorities and affected Dutch native residents in Enschede did not differ in their MHS utilization in the period 6–18 months post-disaster when differences in mental health problems were taken into account (Van der Velden et al., 2005).

The estimated response at T1 among affected residents was relatively low (32.8%) and prevalence estimates of mental health problems could be biased by the low response rate at T1. However, low response percentages are not unusual in studies where blood samples are also taken (Van den Viet et al., 2002). Furthermore, differences in health and MHS utilization between the affected residents and the comparison group cannot be explained by differ-

ences in demographic characteristics, since these were similar.

We used self-rating measures for mental health problems. Both IES and SCL-90-R are wellvalidated instruments for intrusions and avoidance reactions, and anxiety and depression symptoms respectively. In our study, no clinical diagnoses were made and clinical assessments may have lead to other results with respect to PTSD.

It is unclear whether our results can be generalized to other types of trauma than technological disasters. In contrast to violence, sexual abuse and war, these traumatic events are not intentional and the traumatic experiences are limited in time (Type I Trauma: Terr, 1991). Intentional events generally lead to poorer levels of health than non-intentional events (Kessler, Sonnega, Bromet, Hughes, & Nelsson, 1995). These circumstances may influence the relationship between mental health problems and MHS utilization (Jaycox, Marschall, & Schell, 2004).

## CONCLUSIONS

Very few disaster studies have examined the relation between post-disaster mental health problems and MHS utilization among affected adult residents. To date, no study has assessed differences in MHS utilization between disaster victims and a comparable group of unaffected people.

Although mental health problems among victims declined, they reported health problems and sought treatment more often than the comparison group. MHS utilization after the fireworks disaster was strongly related to post-disaster mental health problems. Findings indicate that MHS utilization among victims with anxiety and depression symptoms was higher than MHS utilization among unaffected people (comparison group) with these symptoms. We assume that the mental health policy after the fireworks disaster made a valuable contribution to this effect. Nevertheless, this result suggests that people with mental health problems are less reluctant to seek treatment when they are affected by a disaster than they normally would be.

Eventually, a large majority of victims with persistent mental health problems used MHS. For instance, of the affected residents with persistent PTSD, 90% had used MHS in the past 4 years. Investigations into the reasons why affected residents with post-disaster mental health problems

hesitate or wait to seek treatment are warranted and may improve activities that stimulate victims of disaster to seek treatment as soon as possible.

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