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Symptom attribution and presentation in general practice after an extreme life event

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Background. A serious life event is likely to shape attributions relating to symptoms experienced afterwards. While they may play an important role in prognosis and seeking care, such perceptions have hardly been studied among survivors of a disaster.

Objective. To investigate the association between self-reported health problems that have been attributed to an extreme life event and the symptoms presented to GPs.

Methods. A two-wave longitudinal survey (2–3 weeks and 18 months) among survivors of a fireworks disaster was combined with a continuous morbidity surveillance in general practice. Symptoms attributed to the disaster reported in an open-ended question in the two waves were analysed using descriptive statistics. Differences in presented symptoms over time were analysed using logistic multilevel analysis.

Results. More than half of the respondents reported health problems, which were, in their opinion, related to the disaster. Psychological problems were most frequently reported in association with the disaster, and in contrast to physical attributed symptoms, presentation of these problems in general practice decreased over time. In the total sample, musculoskeletal symptoms were less frequently presented in the longer term. Survivors who attributed symptoms to the disaster at both waves or after 18 months only most often presented such symptoms to the GP.

Conclusion. Survivors attributed psychological problems and physical symptoms to the disaster at short-term and midterm post-disaster. Most of these survivors presented such symptoms to the GP. Attribution of symptoms to an extreme life event such as a disaster may therefore require special attention from the GP.

Keywords. Causal attributions, disasters, family medicine, illness perceptions, symptoms.

Introduction

When people experience symptoms, the way they perceive their symptoms may play an important role in prognosis and may influence their care seeking behaviour. Such perceptions include causal attributions and thoughts about the future course of symptoms. Pessimism about the course, not perceiving personal control over symptoms, and holding exclusively somatic attributions have been associated with a poor prognosis[1–4] and seeking care for symptoms.[5]

The experience of a serious negative life event affects health and well-being on multiple levels. Such an event is likely to shape perceptions about experienced symptoms. Disasters are extreme life events affecting many people at once. Psychological reactions to disasters have been well documented,[6–8] and physical symptoms may arise as a consequence of psychological trauma or stress.[9] The occurrence of disasters seems to be increasing,[10] posing a challenge to health care systems to provide care as needed. Few epidemiological studies into health consequences of disasters have investigated the long-term impact of a disaster, indicating an increase in the use of (primary) health care and a prolonged prevalence of symptoms in part of the survivor population.[11–13] Studies that focused on the use of mental health care showed that in general a minority of survivors with severe mental health problems made use of these services.[12,14]

These studies report symptoms of acute or posttraumatic stress disorder, which indicate a direct link between the reported symptoms and disaster.[15]

However, survivors may experience a much wider range of symptoms that they may or may not attribute to the disaster, possibly influenced by media reports or other societal circumstances during the aftermath.[16] While studies have reported on the increased use of care, the extent to which survivors use (primary) health care for symptoms they attribute to their experience of a disaster has not been explored. This is important since specific disaster attributions may negatively influence the prognosis of symptoms.

The aim of this study was to explore the range and frequency of self-reported health problems in the aftermath of a disaster that survivors attributed to the disaster and to what extent these symptoms were presented in general practice during three equal periods post-disaster. The main research questions were (i) What percentage of survivors attributed symptoms to the disaster? (ii) What are the symptoms that survivors attributed to the disaster when asked in an open question, at short-term and midterm post-disaster? (iii) To what extent were attributed symptoms presented to the GP during three equal periods after the disaster?

For this purpose, we analysed data from a longitudinal study among survivors of a fireworks disaster in The Netherlands (city of Enschede) and the electronic medical records (EMRs) of their GPs.[17] In this study, we focus on the period up to 27 months after the disaster.

Methods

Design and data collection

Survey. A two-wave longitudinal survey was performed among affected residents. An initial survey (Wave 1) was set up in May 2000, 2–3 weeks after the disaster. Approximately 18 months after the disaster, in November 2001, a second survey (Wave 2) was conducted.

A total of 1567 affected residents participated (estimated response 35%) in the first survey and 1116 also completed the second questionnaire (response rate 71%). This makes an overall response rate for both waves of ~25%.

The study was approved by the Medical Ethical Committee of the Netherlands Organization for Applied Scientific research (TNO), and informed consent was obtained from all respondents before participation in the study.

Participants completed several questionnaires on health problems. The design and used questionnaires are discussed elsewhere in more detail.[17] For the aim of this study, in which we focus on symptoms that were attributed to the disaster, we used the following survey question: 'Do you have health problems which are, in your opinion, related to the fireworks depot explosion?' (yes/no). This question was followed by an open question: 'If so, what kind of health problems?'. These self-reported health problems were coded by experienced, trained medical students according to the International Classification of Primary Care (ICPC).[18]

General practice. The longitudinal health survey was combined with a continuous surveillance of health problems recorded in the registration systems of GPs. In the Dutch health care system, it is obligatory for each citizen to be registered on the list of only one practice, which must first be consulted if referral to secondary care is needed. Data on symptoms from the EMRs were used to monitor health problems of survivors presented in general practice. Presented symptoms were documented in accordance with the ICPC; ICPC codes were classified in corresponding chapters of health problems.

For analysis of EMR data, the period in which the health survey was performed was divided into two equal periods: the first 9 months post-disaster (between 13 May 2000 and 12 February 2001) and the following 9 months (between 13 February 2001 and 12 November 2001). A third 9-month period was distinguished following Wave 2 (between 13 November 2001 and 12 August 2002). Patients were informed about the participation of their GP in this monitoring study and could object to the use of their data; however, nobody did. Data collection was performed in accordance with the privacy protection procedures of the Dutch Data Protection Authority.

Data analysis

Descriptive statistics were used to describe survivor characteristics and self-reported health problems. Differences in health problems presented to the GP over time were analysed using multilevel logistic regression analysis (patients at level 1 and practices at level 2) with time period as independent factor and presentation of symptoms as dependent factor.

Results

The question on symptom attribution was completed by 1009 participants of the 1116 survivors who participated in both surveys. The mean age was 43 years (SD 14) and percentages of men and women were 50%. Compared to the 1567 respondents to the first survey, these 1009 participants were on average younger (43 versus 40; $P < 0.001$); the distribution of gender did not differ between participants of the first survey and completers of the attribution question ($P = 0.50$). In this study, data on presented symptoms from the EMRs were available for 1050 survivors. Data from both sources were available for a total of 985 study participants, representing ~22% of the total group of affected residents.

Self-reported symptoms attributed to the disaster

Of all 1009 participants who completed the attribution question, 604 survivors (60%) reported having symptoms in association with the disaster at one or both waves. This group had a somewhat larger percentage of women (54% versus 47% men; $P = 0.002$) and did not differ in age with those who did not attribute symptoms to the disaster ($P = 0.108$). One-fifth (227, 22%) attributed health problems 3 weeks after the disaster only; another 121 (12%) of the survivors only attributed health problems 18 months post-disaster and 256 survivors (25%) reported health problems attributed to the disaster on both waves.

Of all 604 participants who reported symptoms in association with the disaster, 584 people specified which symptoms they attributed to the disaster. Symptoms that were most often reported after 3 weeks or after 18 months are presented by category in Table 1. These will be referred to in the rest of the paper when 'symptoms' are mentioned, unless specified otherwise.

Psychological problems were reported by 384 of the survivors (66% of 584) and were most often reported at either one of the waves. Within this chapter, feeling anxious ($n = 171$), acute stress ($n = 110$) and insomnia ($n = 141$) were the most prevalent problems.

Symptoms that were included in the ICPC chapter 'General health problems' were reported by 192 of the survivors (33% of 584), mostly tiredness ($n = 187$). Other physical symptoms that were frequently reported in association with the disaster were neurological symptoms, predominantly headache ($n = 110$) and dizziness ($n = 28$), respiratory problems (mostly dyspnoea, $n = 47$; cough, $n = 46$; throat problems, $n = 33$) and musculoskeletal problems (mostly problems of the back, $n = 47$; neck, $n = 41$; shoulder, $n = 24$). In all categories, a substantial part of attributed symptoms were reported after 3 weeks or 18 months only. Neurological and respiratory symptoms were most often reported after 3 weeks only. Health problems in the other ICPC chapters were reported by smaller numbers of survivors (0–5% in both waves, not in table).

Symptoms presented in general practice

A majority of survivors (88%) presented symptoms to a GP from psychological, general, neurological, musculoskeletal or respiratory categories at any time during the three post-disaster periods. Most frequently presented were musculoskeletal, psychological and respiratory problems (Table 2). Presentation of psychological problems mostly decreased over time, with the largest decrease between 10 and 18 months (second period), while the presentation of musculoskeletal problems showed a slight increase in the second period and a subsequent significant decrease in the third post-disaster period (19–27 months).

Self-reported health problems attributed to the disaster and presented in general practice

The majority (92%) of the survivors who attributed symptoms to the disaster presented at least one of such symptoms to the GP at any time during the 27 months post-disaster, with proportions ranging from 38% of neurological symptoms to 81% of musculoskeletal problems (left side of Table 3). Conversely, 57% of all symptoms from these categories that were presented to the GP by survivors in this population were attributed to the disaster, psychological problems most often (50%) (right side of Table 3).

Tables 4, 5 and 6 show the prevalence estimates of the main symptoms presented in general practice that were attributed to the disaster at either or both waves (Table 4), after 3 weeks (Table 5) or 18 months only (Table 6). Table 4 (presented symptoms among patients who attributed such symptoms to the disaster) and Table 2 (presented symptoms in the total sample) show that presentation of symptoms to the GP was relatively frequent among survivors who attributed such symptoms to the disaster compared to the total study sample. Presentation of psychological problems significantly decreased both in the total sample and among patients attributing these symptoms to the disaster. In contrast to the total sample, the presentation of musculoskeletal problems in this subgroup showed no significant decrease. Tables 5 and 6 show that proportions of symptoms presented in the first period post-disaster did not differ much between survivors who reported disaster-related symptoms at Wave 1 or Wave 2 only. However, those who attributed symptoms at Wave 2 only, more frequently presented such symptoms to the GP in the second and third period than those who attributed these symptoms at Wave 1 only. Symptoms were most often presented to the GP by survivors who attributed symptoms to the disaster only at Wave 2 (93%

TABLE 1 *Most frequently reported disaster-related symptoms (n = 1009) on the questionnaire classified by ICPC chapter*

ICPC chapter	Wave 1 only (3 weeks), *n* (%)	Both waves, *n* (%)	Wave 2 only (18 months), *n* (%)	Not reported, *n* (%)
Psychological	139 (14)	82 (8)	163 (15)	625 (62)
General	90 (8)	22 (2)	80 (7)	817 (81)
Neurological	84 (8)	8 (1)	44 (4)	873 (87)
Respiratory	80 (7)	12 (1)	30 (3)	887 (88)
Musculoskeletal	62 (6)	19 (2)	53 (5)	875 (87)

TABLE 2 *Symptoms presented in general practice in three post-disaster periods (N = 1050)*

	0–27 months, *n* (%)	0–9 months, *n* (%)	10–18 months, *n* (%)	19–27 months, *n* (%)
Psychological[a]	539 (51)	422 (40)	251 (24)	216 (21)
Musculoskeletal[b]	696 (66)	408 (39)	442 (42)	365 (35)
Respiratory	524 (50)	306 (29)	303 (29)	268 (26)
General	375 (36)	158 (15)	178 (17)	169 (16)
Neurological	226 (22)	110 (11)	108 (11)	85 (8)

[a]$P < 0.001$ for differences between the first period and second or third period (multilevel logistic regression).
[b]$P < 0.001$ for differences between the second and third period (multilevel logistic regression).

TABLE 3 *Self-reported disaster-related symptoms and presentation of symptoms to the GP up to 27 months post-disaster (N = 985)*

	Attributed to the disaster	Attributed to disaster and presented to GP, *n* (%)	Presented to the GP	Presented to GP and attributed to disaster, *n* (%)
Psychological	384	258 (68)	513	258 (50)
Musculoskeletal	135	109 (81)	655	109 (17)
Respiratory	121	75 (62)	496	75 (15)
General	187	82 (62)	353	82 (23)
Neurological	133	51 (38)	213	51 (24)

TABLE 4 *Self-reported disaster-related symptoms at Wave 1 and/or 2, and presentation of symptoms to the GP up to 27 months post-disaster (N = 584)*

	Self-report	Presentation to the GP during three periods post-disaster		
	n at both or either one of the waves	0–9 months, *n* (%)	10–18 months, *n* (%)	19–27 months, *n* (%)
Psychological[a]	384	203 (53)	134 (35)	126 (33)
Musculoskeletal	135	77 (57)	71 (53)	64 (47)
Respiratory	121	51 (42)	50 (41)	37 (31)
General	187	35 (19)	45 (24)	33 (18)
Neurological	133	28 (21)	25 (19)	22 (17)

[a]$P < 0.001$ for differences between the first period and second or third period (multilevel logistic regression).

TABLE 5 *Self-reported disaster-related symptoms at Wave 1 only (3 weeks post-disaster) and presentation of symptoms to the GP up to 27 months post-disaster (N = 222, 23% of 985)*

	Self-report	Presentation to the GP during three periods post-disaster			
	n (Wave 1)	0–27 months, *n* (%)	0–9 months, *n* (%)	10–18 months, *n* (%)	19–27 months, *n* (%)
Psychological[a]	136	116 (52)	64 (47)	35 (26)	29 (21)
Musculoskeletal	63	144 (65)	34 (54)	27 (43)	24 (38)
Respiratory	79	109 (49)	32 (41)	27 (34)	20 (25)
General	87	83 (37)	15 (17)	18 (21)	14 (16)
Neurological	81	61 (28)	13 (16)	9 (11)	8 (10)

[a]$P < 0.001$ for differences between the first period and second or third period (multilevel logistic regression).

presented to the GP) or at both waves (90%), and least often by survivors who did not attribute symptoms to the disaster (80%) (chi-square test; $P < 0.001$). Survivors who reported symptoms in relation to the disaster at both waves mostly did not attribute similar symptoms at both waves (Table 7).

Discussion

In this study, we examined self-reported health problems attributed to the Enschede fireworks disaster in relation to symptoms presented in general practice by survivors. A majority of the study participants (60%)

TABLE 6 *Self-reported disaster-related symptoms at Wave 2 only (18 months post-disaster) and presentation of symptoms to the GP up to 27 months post-disaster (N = 121, 12% of 985)*

	Self-report	Presentation to the GP during three periods post-disaster			
	n (Wave 2)	0–27 months, *n* (%)	0–9 months, *n* (%)	10–18 months, *n* (%)	19–27 months, *n* (%)
Psychological[a,b]	162	80 (66)	86 (53)	69 (43)	64 (40)
Musculoskeletal	53	95 (79)	30 (57)	31 (59)	30 (57)
Respiratory	30	69 (57)	12 (40)	16 (53)	13 (43)
General	79	53 (44)	15 (19)	22 (28)	16 (20)
Neurological	44	31 (26)	11 (25)	14 (32)	13 (30)

[a]$P < 0.05$ for differences between the first and second period (multilevel logistic regression).
[b]$P < 0.01$ for differences between the first and third period (multilevel logistic regression).

TABLE 7 *Symptoms attributed to the disaster and presented to the GP among survivors reporting disaster-related symptoms at both waves (3 weeks and 18 months post-disaster) (N = 256, 26% of 985)*

	Symptoms attributed at both waves, *n* (%)	Symptoms attributed at one or both waves, *n* (%)	Symptoms presented to the GP at any time (0–27 months), *n* (%)
Psychological	82 (32)	200 (78)	184 (73)
Musculoskeletal	22 (9)	108 (42)	181 (72)
Respiratory	8 (3)	81 (32)	145 (58)
General	19 (7)	85 (33)	113 (45)
Neurological	12 (5)	60 (23)	67 (27)

reported health problems that they attributed to the disaster. Psychological problems were most often attributed to the disaster; physical symptoms were mainly from the general, neurological, respiratory and musculoskeletal categories. Most of the participants who attributed symptoms to the disaster (92%) presented such symptoms to the GP, in particular musculoskeletal, psychological and respiratory symptoms and fatigue.

Interestingly, 12% of the sample attributed symptoms to the disaster at Wave 2 only, and when survivors attributed symptoms to the disaster at both waves, the symptoms were mostly different at either wave. These results seem to concern symptoms that are not acute, possibly reflecting a physical manifestation of distress in different ways, indicating a shift in symptoms or a shift in attention to experienced symptoms. Previous results that seem to be in line with this showed that prevalence rates of musculoskeletal symptoms recorded in general practice were higher among victims (and controls) with pre-disaster psychological problems.[19] While the presentation of psychological problems showed a significant decline over time, this was mostly not the case for physical symptoms. Musculoskeletal symptoms among patients relating such symptoms to the disaster were most often and consistently presented to the GP during the three periods of monitoring. Most symptoms attributed to the disaster at Wave 2 only were equally or more often presented to the GP in the first post-disaster period than in later periods, corresponding with the timing of Wave 2. A possible explanation for this is that survivors may have presented a symptom to the GP initially and, in the absence of an explanation, may have attributed it to the disaster later.

Several studies have shown that perceptions of patients about their symptoms, including causal attributions, may contribute to the prognosis of the symptoms.[2–5] Perceptions may become perpetuating factors in prognosis and are potentially modifiable. Therefore, it would be helpful to know the reasons why survivors attributed symptoms to the disaster. This raises the question to what extent attributed symptoms actually existed before the disaster. Since there are no self-reported data available from the period before the disaster, and self-reported symptoms cannot simply be compared to data available from monitoring in general practice, there is no straight answer to this question. When comparing pre-disaster medical data with attribution of symptoms post-disaster, patients with neurological or psychological symptoms had more often visited the GP with similar symptoms. A comparative analysis using data from GP consultations up to 16 months pre-disaster showed that for attributed symptoms from all major symptom categories, except musculoskeletal problems, patients who consulted the GP for problems before the disaster more often consulted the GP for problems from the same category in the period post-disaster. These findings might indicate towards the possibility that

part of the patients who attributed symptoms to the disaster already had similar symptoms before the disaster.

The process of attributing symptoms to a disaster may be complex and multidimensional. Evidently, extreme life events have health consequences, which may last for a prolonged period of time.[12,20] Survivors may relate their symptoms to somatic causes due to (supposed) exposure to substances during the disaster. This has been the case in many survivors of the Bijlmermeer aeroplane crash in The Netherlands, when possible health effects had not been measured until 6 years after the disaster.[21] However, the outcome of investigations on the possible exposure to toxic substances immediately after the fireworks disaster showed that there was no harmful exposure.[22] Alternatively, survivors may relate their physical symptoms to emotional stress experienced during and after the disaster. Both reasons for attributing symptoms to the disaster may induce, prolong or increase the experience of (still) being a victim rather than having resilience, which may hinder recovery of symptoms. However, patients may also hold several different attributions for symptoms at once.[23]

Another possibility for disaster attribution are symptoms or problems because of injuries, which may have been included among symptoms in the musculoskeletal category reported at Wave 1 only and presented in the first period post-disaster. In a previous study on physical symptoms after the fireworks disaster, 7% of 1216 survivors had an injury while 21% received a diagnosis of various symptoms without a specific diagnosis ('medically unexplained'). Compared to the non-injured, injured survivors had a higher number of such non-specific symptoms both before and after the disaster.[24] This finding illustrates that survivors may experience symptoms for different reasons; they may also attribute (similar) symptoms to the disaster for different reasons.

Whereas strengths of this study are the longitudinal design and the large sample size, some limitations should be noted. The attribution of psychological problems might be underestimated, due to the order of health-related questions in the surveys. In both surveys, the question on attribution was asked before questions on emotional consequences of the disaster; in the first survey, the question was asked after questions on medication, in the second survey after a series of questions on general physical symptoms and specific respiratory symptoms. The questions preceding the open-ended question may have influenced the answers: respondents may have been triggered to think about physical symptoms rather than psychological problems. Results from previous studies on the same disaster indeed did show that such problems were frequently present after 2–3 weeks; approximately three out of four survivors reported intense intrusions and avoidance reactions.[15] Previous results of symptom prevalence after the fireworks disaster showed that a majority of survivors reported fatigue and musculoskeletal symptoms after 18 months.[25] If not under-reported, the results suggest that in most cases, survivors did not attribute these symptoms to the disaster.

Another methodological issue to be considered is the representativeness of the study sample. The sample is limited to those survivors who participated in both surveys. Some selection has taken place—compared to non-participants, participants in the surveys were more likely to be women, between 45 and 64 years old, immigrants and living with a partner. Moreover, before as well as after the disaster, study participants more often visited the GP than non-participants.[26]

In this study, we did not investigate the specific reasons for attributions, neither do we know to what extent GPs were informed regarding (reasons for) disaster attributions of presented symptoms. This could be quite low, considering outcomes of a study on symptoms attribution after the Bijlmermeer aeroplane crash showing that only 6% of symptoms that were attributed to the disaster by survivors were associated with the disaster by GPs.[27]

We showed that part of the survivors (12%) attributed symptoms to the disaster only later in time, while alternatively, reported symptoms after a disaster may not automatically be linked to the event itself. For GPs, it is important to be aware of specific attributions in patients since these may negatively influence the future course of symptoms while they may be modified. Both in practice and in future studies, attention is required not only for symptoms but also for patients' attributions and their specific reasons.

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Declaration

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References

[1] Foster NE, Bishop A, Thomas E *et al*. Illness perceptions of low back pain patients in primary care: what are they, do they

change and are they associated with outcome? *Pain* 2008; **136:** 177–87.

[2] Frostholm L, Oernboel E, Christensen KS *et al*. Do illness perceptions predict health outcomes in primary care patients? A 2-year follow-up study. *J Psychosom Res* 2007; **62:** 129–38.

[3] Huibers MJ, Bleijenberg G, van Amelsvoort LG *et al*. Predictors of outcome in fatigued employees on sick leave: results from a randomised trial. *J Psychosom Res* 2004; **57:** 443–9.

[4] Nijrolder I, van der Windt D, van der Horst H. Prediction of outcome in patients presenting with fatigue in primary care. *Br J Gen Pract* 2009; **59:** e101–9.

[5] Frostholm L, Fink P, Christensen KS *et al*. The patients' illness perceptions and the use of primary health care. *Psychosom Med* 2005; **67:** 997–1005.

[6] 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.

[7] Norris FH, Friedman MJ, Watson PJ *et al*. 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry* 2002; **65:** 207–239.

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

[9] Schnurr PP, Jankowski MK. Physical health and post-traumatic stress disorder: review and synthesis. *Semin Clin Neuropsychiatry* 1999; **4:** 295–304.

[10] http://www.em-dat.net/. (accessed December 2009).

[11] Dorn T, Yzermans CJ, Kerssens JJ, Spreeuwenberg PM, van der Zee J. Disaster and subsequent healthcare utilization: a longitudinal study among victims, their family members, and control subjects. *Med Care* 2006; **44:** 581–9.

[12] Van der Velden PG, Grievink L, Kleber RJ *et al*. Post-disaster mental health problems and the utilization of mental health services: a four-year longitudinal comparative study. *Adm Policy Ment Health* 2006; **33:** 279–88.

[13] Yzermans CJ, Donker GA, Kerssens JJ *et al*. Health problems of victims before and after disaster: a longitudinal study in general practice. *Int J Epidemiol* 2005; **34:** 820–6.

[14] Rodriguez JJ, Kohn R. Use of mental health services among disaster survivors. *Curr Opin Psychiatry* 2008; **21:** 370–8.

[15] Drogendijk AN, Dirkzwager AJ, Grievink L *et al*. The correspondence between persistent self-reported post-traumatic problems and general practitioners' reports after a major disaster. *Psychol Med* 2007; **37:** 193–202.

[16] ten Veen PM, Morren M, Yzermans CJ. The influence of news events on health after disaster: a longitudinal study in general practice. *J Trauma Stress* 2009; **22:** 505–15.

[17] Van der Velden PG, Yzermans CJ, Grievink L. Enschede fireworks disaster. In Neria Y, Galea S, Norris FH (eds). *Mental Health and Disasters*, New York, NY: Cambridge University Press, 2009: 473–96.

[18] Lamberts H, Wood M. *ICPC-International Classification of Primary Care.* Oxford: Oxford University Press, 1987.

[19] Soeteman RJ, Yzermans CJ, Kerssens JJ *et al*. The course of post-disaster health problems of victims with pre-disaster psychological problems as presented in general practice. *Fam Pract* 2006; **23:** 378–84.

[20] Bolton D, O'Ryan D, Udwin O, Boyle S, Yule W. The long-term psychological effects of a disaster experienced in adolescence: II: general psychopathology. *J Child Psychol Psychiatry* 2000; **41:** 513–23.

[21] IJzermans J, Gersons BPR. The chaotic aftermath of an airplane crash in Amsterdam: a second disaster. In Havenaar JM, Cwikel JG, Bromet EJ (eds). *Toxic Turmoil: Psychological and Societal Consequences of Ecological Disaster*, New York, NY: Kluwer Academic, 2002: 85–99.

[22] Roorda J, van Stiphout WA, Huijsman-Rubingh RR. Post-disaster health effects: strategies for investigation and data collection. Experiences from the Enschede firework disaster. *J Epidemiol Community Health* 2004; **58:** 982–7.

[23] Rief W, Nanke A, Emmerich J, Bender A, Zech T. Causal illness attributions in somatoform disorders: associations with comorbidity and illness behavior. *J Psychosom Res* 2004; **57:** 367–71.

[24] van den Berg B, Yzermans CJ, Van der Velden PG, Stellato RK, Brunekreef B. Risk factors for unexplained symptoms after a disaster: a five-year longitudinal study in general practice. *Psychosomatics* 2009; **50:** 69–77.

[25] van den Berg B, Grievink L, Stellato RK, Yzermans CJ, Lebret E. Symptoms and related functioning in a traumatized community. *Arch Intern Med* 2005; **165:** 2402–7.

[26] Grievink L, Van der Velden PG, Yzermans CJ, Roorda J, Stellato RK. The importance of estimating selection bias on prevalence estimates shortly after a disaster. *Ann Epidemiol* 2006; **16:** 782–8.

[27] Donker GA, Yzermans CJ, Spreeuwenberg P, van der Zee J. Symptom attribution after a plane crash: comparison between self-reported symptoms and GP records. *Br J Gen Pract* 2002; **52:** 917–22.