

SHORT REPORT

Psychological, musculoskeletal, and respiratory problems and sickness absence before and after involvement in a disaster: a longitudinal study among rescue workers

A J E Dirkzwager, C J Yzermans, F J M Kessels

Occup Environ Med 2004;61:870-872. doi: 10.1136/oem.2003.012021

Background: On 13 May 2000 a firework depot situated in a residential area in the Netherlands exploded. Many rescue workers were involved in the aftermath of this explosion.

Aims: To examine the longitudinal course of psychological, musculoskeletal, and respiratory problems and sickness absence among rescue workers involved.

Methods: The study population was composed of 1036 rescue workers. Data on health and sickness absence both before and after the disaster were collected from the electronic database of the rescue workers' occupational physicians. Health problems were coded according to an adapted version of the ICD-10.

Results: After the disaster a long term increase was found in psychological, musculoskeletal, and respiratory problems. Compared to six months before the disaster, the average length of sickness absence in the first half year after the disaster increased from 6.6 to 11.6 days, and decreased slowly in the following six month periods.

Conclusions: Rescue workers involved in a disaster may experience subsequent impairment in occupational functioning.

As part of their job, rescue workers are regularly exposed to stressful events and are brought into action at times of major disasters. This may put them at risk for the development of health problems such as post-traumatic stress disorder, depression, anxiety, and physical symptoms.¹⁻³ Occupational functioning may also become impaired; a previous study showed that rescue workers exposed to an earthquake reported more sick days afterwards than a control group.⁴ Until now, however, little prospective data have been available on the potential health consequences of disasters for rescue workers. This paper presents findings on the health status of Dutch rescue workers involved in a major explosion of a firework depot situated in the city of Enschede in the Netherlands (13 May 2000). This explosion resulted in 22 deaths, about 1000 injured, and 2000 homeless persons. Environmental measurements and analysis of blood and urine samples (of all persons involved in the disaster who wanted to participate in a medical check up) were conducted shortly after the disaster and showed that there was no significant exposure to relevant toxicological agents. The aim of this study is to examine health problems and sickness absence among the rescue workers both before and after the disaster.

METHODS

Data on health problems and sickness absence were obtained through the consultations of the rescue workers with their

occupational physicians. In the Netherlands, most organisations have an occupational physician and an employee is generally seen by this doctor when he or she has been absent for more than a week. Since 1999, these doctors register all sickness absences and all encounters with their clients electronically. Rescue workers involved in the emergency response were identified and marked in the database of the occupational physicians in the region. The data were anonymised and were analysed for five half-year periods, starting six months before the disaster until two years afterwards. Health problems were classified by the occupational physician according to an adapted for occupational medicine version of the International Classification of Diseases (ICD-10). This adapted classification is based on 12 organ systems and on psychological problems.⁷ With respect to the health problems presented to the occupational physician, the present study focused on the three most prevalent health problems (that is, psychological, musculoskeletal, and respiratory symptoms). For each sick leave the date of the first and the last day were registered. Thus, it was possible to calculate the average length of the sickness absence (persons with no sickness absence had a length of zero days). Sickness absence was recorded in a separate database and also included sickness absence of less than one week.

A total of 1075 rescue workers involved in the emergency response were identified. Data were available for 1036 rescue workers (96%) who worked at this job during the entire study period (785 policemen, 140 firefighters, 55 ambulance personnel, and 56 municipal personnel; the latter group was involved in placing fences around the disaster area and cleaning up the area after the fire was extinguished). The majority were men (81%) and the mean age in 2000 was 41.4 (SD 8.5).

RESULTS

The number of rescue workers who consulted the occupational physician for psychological problems increased from 2.9% six months pre-disaster to 5.3% in the half year post-disaster (see table 1; McNemar test: $\chi^2 = 9.8$; $p < 0.01$). Compared to the period before the disaster, an increase in presented musculoskeletal problems was found in the second half year after the disaster (McNemar test: $\chi^2 = 4.5$; $p < 0.05$). The highest increase in respiratory problems was found in the second half year post-disaster (McNemar test: $\chi^2 = 12.9$; $p < 0.001$). Two years after the disaster the prevalence of psychological disorders, and musculoskeletal and respiratory problems was still significantly increased when compared to the pre-disaster period.

No significant differences were found in the pre-disaster period between the four types of occupation. Furthermore, the rescue workers did not differ regarding presented psychological problems in the two years post-disaster. In

Main messages

- Both pre- and post-disaster data were available on health problems presented to the occupational physician by rescue workers involved in a disaster.
- Post-disaster a long term increase was found in psychological, musculoskeletal, and respiratory problems.
- The average number of sick days increased from 6.6 in the six months pre-disaster to 11.6 in the first six months post-disaster.

Policy implications

- Healthcare workers should be alert for long term increases in health problems and occupational impairments among rescue workers involved in a major disaster.
- Occupational physicians and other healthcare workers should be alert not only for increased psychological problems but also for potentially delayed physical symptoms.

the second half year post-disaster significant differences were found between rescue workers regarding musculoskeletal symptoms, with the largest percentages found among municipal personnel (for the second half year post-disaster: 28.1% among municipal personnel, 9.1% among ambulance personnel, 4.9% among firefighters, and for 4.8% among police personnel, $\chi^2 = 49.4$; $df = 3$, $p < 0.001$). Municipal personnel also reported more respiratory symptoms post-disaster, with 17.5% respiratory symptoms during the first half year post-disaster compared to 1% or less among the other rescue workers ($\chi^2 = 83.3$; $df = 3$, $p < 0.001$).

The length of sickness absence was calculated for all sick leaves regardless of the cause of the sickness absence (see table 1). The average number of sick days increased from 6.6 days (SD 22.8) in the six months before the disaster to 11.6 days (SD 48.4) in the first six months post-disaster (paired t test: $t = -3.09$, $df = 1035$, $p < 0.01$). The second half year after the disaster the number of sick days was still increased (paired $t = -2.37$, $df = 1035$, $p < 0.05$). In the following half year periods the length of sickness absence was no longer significantly different from the period prior to the disaster. No significant differences in length of sickness absence were found between the different occupations.

DISCUSSION

Although the majority of the rescue workers did not present any health problem to their occupational physician, we did find a lasting increase in psychological and musculoskeletal symptoms presented to the occupational physician. It should be realised that problems presented to the occupational physician are generally serious enough to interfere with work. The results indicate that occupational physicians and other healthcare workers should be alert not only for increased psychological problems but also for potentially delayed physical symptoms, since musculoskeletal symptoms increased during the second half year post-disaster. Exposure to a disaster may also result in impairment in occupational functioning, as was shown by the increased length of

sickness absence in the two half year periods post-disaster. However, the large standard deviation suggests that a relatively small group of persons with long lasting absence strongly influenced the mean length of sickness absence. These results are consistent with previous findings suggesting that exposure to disasters may result in health problems among rescue workers, and that rescue workers are not immune from exposure to such events.²⁻⁶

Some limitations need to be considered. Firstly, the present study used the electronic records of occupational physicians. Although this approach reduces the problems associated with patients' self reports (recall bias), it remains unclear how accurate these registries are. Secondly, the health problems examined refer to problems of rescue workers who actually were on sick leave for more than a week and saw their occupational physician. Not all persons with symptoms will drop out from work and see their physician. Therefore, our sample may be selective, applying to serious and long term health problems. Thirdly, no control group of rescue workers not exposed to the disaster was available. Therefore, we cannot be certain that the increase in health problems and sickness absence is entirely caused by the disaster. Potential future comparison with a control group of rescue workers not exposed, could provide more knowledge about specific disaster related health consequences among rescue workers.

An important strength of the study was, however, that we did have the opportunity to compare pre- and post-disaster health problems of a large sample of rescue workers. Having pre-disaster data on health problems is unique, and most previous studies lack such baseline data. Therefore, the present study adds important knowledge on the course of health problems among rescue workers exposed to a disaster.

Authors' affiliations

A J E Dirkzwager, C J Yzermans, Netherlands Institute for Health Services Research (NIVEL), Utrecht, Netherlands
F J M Kessels, Arbo Unie East Netherlands, Enschede, Netherlands

This study was funded by a grant obtained from the Ministry of Health, Welfare and Sports in the Netherlands.

Table 1 Health problems of rescue workers presented to the occupational physician, and sickness absence before and after the disaster (13 May 2000)

	6 months pre-disaster	1-6 months post-disaster*	7-12 months post-disaster†	13-18 months post-disaster‡	19-24 months post-disaster§
Health problems					
Musculoskeletal	4.2% (n=44)	4.2% (n=44)	6.4% (n=66)	5.9% (n=61)	6.3% (n=65)
Psychological	2.9% (n=30)	5.4% (n=56)	6.4% (n=66)	5.3% (n=55)	5.5% (n=57)
Respiratory	0.5% (n=5)	1.8% (n=19)	2.4% (n=25)	0.9% (n=9)	1.7% (n=18)
Sickness absence					
Mean length (SD)	6.6 (22.8)	11.6 (48.4)	9.8 (38.5)	6.8 (27.2)	7.1 (23.9)

*Discordant pairs of the McNemar test pre-post: psychological: 45, 19 ($p < 0.01$); musculoskeletal: 35, 35 ($p = 1.0$); respiratory: 17, 3 ($p < 0.01$).

†Discordant pairs of the McNemar test pre-post: psychological: 60, 24 ($p < 0.001$); musculoskeletal: 60, 38 ($p < 0.05$); respiratory: 24, 4 ($p < 0.001$).

‡Discordant pairs of the McNemar test pre-post: psychological: 50, 25 ($p < 0.01$); musculoskeletal: 56, 39 ($p = 0.10$); respiratory: 7, 3 ($p = 0.34$).

§Discordant pairs of the McNemar test pre-post: psychological: 49, 22 ($p < 0.01$); musculoskeletal: 60, 39 ($p < 0.05$); respiratory: 17, 4 ($p < 0.01$).

Correspondence to: Dr A J E Dirkzwager, Netherlands Institute for Health Services Research (NIVEL), PO Box 1568, 3500 BN Utrecht, Netherlands; a.dirkzwager@nivel.nl

Accepted 22 April 2004

REFERENCES

- 1 **Robinson HM**, Sigman HM, Wilson JP. Duty related stressors and PTSD symptoms in suburban police officers. *Psychol Rep* 1997;**81**:835–45.
- 2 **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**:207–39.
- 3 **McFarlane AC**, Papay P. Multiple diagnosis in posttraumatic stress disorders in victims of a natural disaster. *J Nerv Ment Dis* 1992;**180**:498–504.
- 4 **Wagners D**, Heinrichs M, Ehler U. Prevalence of symptoms of posttraumatic stress disorder in German professional firefighters. *Am J Psychiatry* 1998;**155**:1727–32.
- 5 **McFarlane AC**, Atchison M, Rafalowicz E, *et al.* Physical symptoms in posttraumatic stress disorder. *J Psychosom Res* 1994;**38**:715–26.
- 6 **Marmar CR**, Weiss DS, Metzler TJ, *et al.* Stress responses of emergency services personnel to the Loma Prieta earthquake interstate 880 freeway collapse and control traumatic incidents. *J Traum Stress* 1996;**9**:63–85.
- 7 **CAS**. *Classificatie van klachten, ziekten en oorzaken voor bedrijfs- en verzekeringsartsen* [Classification of complaints, diseases and causes for company and insurance doctors]. Utrecht: Lisv, 1997.