

## ORIGINAL PAPER

A.C. McFarlane · J.R. Clayer · C.L. Bookless

**Psychiatric morbidity following a natural disaster:  
an Australian bushfire**

Accepted: 19 June 1996

**Abstract** This study investigated the prevalence of mental health problems after a major bushfire in Australia and examined the validity of the General Health Questionnaire (GHQ) (Goldberg 1978) against the Anxiety, Affective and Post-Traumatic Stress Disorder modules of the Diagnostic Interview Schedule (DIS; Robins et al. 1981). Study 1 was carried out 12 months after the Ash Wednesday bushfires and sought to include all the victims of the fires. Study 2 was conducted 20 months after the fires and included a sample of victims who had experienced major losses in the fires. Twelve months after the fires, 42% ( $n = 1,526$ ) of the victims were defined as a potential psychiatric case using the GHQ. This rate indicated a significantly greater level of morbidity than found in communities that have not experienced a natural disaster. Twenty months after the fires, 23% ( $n = 43$ ) were defined as “cases”. The 28-item GHQ was found to be a valid instrument for defining the presence of psychiatric disorder in a disaster-affected community. The findings demonstrated that lasting psychiatric morbidity is associated with natural disasters.

**Introduction**

Studying the impact of natural disasters provides information about the role that traumatic life events play in the onset and maintenance of psychiatric illness (Gist and Lubin 1989; McFarlane 1985). In particular, if

a significantly increased level of chronic morbidity can be demonstrated, a substantial case can then be made for instigating prevention programmes (Raphael 1980). However, although many disasters have been studied, controversy continues as to whether these events have a long-term impact on the mental health of the affected communities (Norris and Uhl 1993).

Conclusions about the long-term effect of natural disasters have been limited by several key problems. First, until recently, a paucity of information about the prevalence of psychiatric disorders in the general community meant that it was difficult to determine the degree of association between natural disasters and mental health. Epidemiological studies that use structured diagnostic interview methods now highlight the high incidence of mental health problems in the general community. Such studies indicate that 20–29% of the general community are likely to have a psychiatric disorder over a 6-month period (Robins and Regier 1991; Kessler et al. 1994; Clayer et al. 1995). Self-report measures of mental health, such as the General Health Questionnaire (GHQ), show that between 16% (Finlay-Jones and Burvill 1977) and 31% (Klugman 1975) can be considered psychiatric “cases”.

Second, the high rate of trauma reported in community studies further complicates the task of isolating the impact of a specific natural disaster. For example, it has been found that 69% of the community experience at least one traumatic event in their lifetime (Norris 1992) and that between the age of 21–30 years this figure is 39% (Breslau et al. 1991). However, despite the reportedly high rate of traumatic events, the prevalence of posttraumatic stress disorder (PTSD) is relatively low, falling between 1% and 9.2% in general studies (Helzer et al. 1987; Davidson et al. 1991; Breslau et al. 1991) to a rate of 12.3% reported in a community sample of women (Resnick et al. 1993).

Third, the rates of disorder are influenced by methodological issues such as non-representative samples, timing of the research and diagnostic instruments.

A.C. McFarlane (✉) · J.R. Clayer · C.L. Bookless  
University of Adelaide, Department of Psychiatry,  
Professorial Unit, Queen Elizabeth Hospital,  
Woodville S.A. 5082, Australia

For example, a 14-year follow-up of the Buffalo Creek disaster found that 25% met the criteria for a current diagnosis of PTSD and that 59% had a lifetime PTSD disorder (Green et al. 1992). Eight months after the Armero disaster in Colombia (Lima et al. 1991) it was found that 70% of the study population ( $n = 102$ ) had a positive DSM III diagnosis and that 42% met the criteria for PTSD. However, neither study was representative of the disaster population; the Green et al. (1992) sample was based on victims seeking damages through litigation and the Lima et al. (1991) subjects were recruited from a disaster relief camp. High rates of disorder have been reported when representative subgroups of victims are studied. For example, the level of morbidity in firefighters 4 months after a major bushfire remained almost unchanged at 29 months, with 21% of the firefighters continuing to experience imagery of the disaster in a way that interfered with their lives (McFarlane 1986a). The unrepresentative nature of many studies, however, limits the generalisability of such findings (Green 1982). Shore et al. (1986) addressed this problem by systematically sampling several populations who had decreasing levels of exposure to the Mt. St. Helen's volcanic disaster. Disorder onset rates for high exposure subjects were 11% for males and 21% for females compared with control rates of 0.9% and 1.9%, respectively (Shore et al. 1986) 38–42 months after the disaster.

This paper reports two studies that sought to minimise these methodological problems. Study 1 aimed to address the problem of unrepresentative sampling by studying the prevalence of psychiatric morbidity in all the registered victims of the disaster. The existence of a detailed register established by community and government agencies meant that the whereabouts of all the victims of the disaster was documented and validated for statutory purposes. Furthermore, the 28-item GHQ was used to provide an index of the mental health of the disaster population. This instrument is a measure of general psychopathology and takes account of the observation that PTSD is only one of the psychopathological consequences of trauma (Yehuda and McFarlane 1995). In addition, the data from several of the major epidemiological studies that have used the GHQ were used for comparison of prevalence rates with this sample.

Study 2 aimed to validate the GHQ against the Anxiety Disorder, Affective Disorder and PTSD modules of the Diagnostic Interview Schedule (DIS) in a sample of victims who had experienced major losses as a result of the fires. These data were collected 20 months after the fires. As the meaning of a raised symptom score in proximity to an event is not only difficult to interpret (McFarlane 1985) but also cannot be seen to be indicative of clinically significant disorder (Tennant et al. 1981), the inclusion of 12-month and 20-month follow-up data adds important information about the long-term effect of the disaster.

---

## Method

The Ash Wednesday bushfires of 16 February 1983 devastated large areas of southeastern Australia. It claimed 28 lives and resulted in injuries to more than 1,500 people, of whom 85 were hospitalised because of the severity of their burns and heat exhaustion. While 385 homes were destroyed, many more were damaged. Nearly 1,000 rural properties were affected by the fires and 10,000 km of fencing was destroyed. Some 560 vehicles were destroyed and sheep and cattle losses exceeded 250,000. Extensive damage to national parks occurred and one-quarter of the commercial forests in the state were burnt. An estimate of the cost of property losses exceeded Australian \$200,000,000. At the time when this study was conducted, much of the reconstruction work was still continuing.

### Study 1

#### *Subjects*

A government department, responsible for community welfare in South Australia, made available its master file of all people who had either registered with the Red Cross immediately following the fires or sought financial assistance from government agencies. A protocol that ensured the confidentiality of registrants was maintained, with all names and addresses computer selected and all questionnaires posted by the government agency. One week after the first anniversary of the disaster, two copies of the study questionnaire were mailed to 2,254 households together with the request that two adults should complete one copy each. Of the potential respondent households, 280 could not be contacted because their address was unknown to Australia Post, reducing the number of households surveyed to 1,974. A reminder letter was sent out 3 weeks later and the media publicised the study.

#### *Instruments*

Demographic information about the subjects and an inventory rating the impact of the disaster were collected. The 28-item GHQ was used (Goldberg 1978) as the measure of psychiatric health and included four subscales, somatic, anxiety, social dysfunction and depression. Similar subscales have been demonstrated in a replication study (Burvill and Knuiman 1983) and the validity has been tested (Koeter 1992; Henderson et al. 1981).

#### *Comparison groups*

To provide comparison with the bushfire victims, a group of 100 non-bushfire subjects completed the 28-item GHQ. This sample comprised employees of a large government department who were matched with the bushfire sample for sex and age. In the absence of prevalence data collected from the disaster victims before the bushfire, nine prevalence studies of psychiatric morbidity in Australia that have used the GHQ were used for comparison groups (Carr et al. 1991; Australian Bureau of Statistics 1978; Klugman 1975; Shiraer and Armstrong 1978; Henderson et al. 1979; Andrews et al. 1977; Finlay-Jones and Burvill 1977). As none of these studies had specifically used the 28-item GHQ, this made direct comparisons between the 12- or 20-item and 28-item prevalence open to some uncertainty (Burvill and Knuiman 1983). Therefore, the raw data were obtained from a large community study conducted in Western Australia (Finlay-Jones and Burvill 1977) and the caseness rates were calculated for the 28-item GHQ using a 4/5 cut-off ( $n = 2,324$ ). The effect of using the 12-item with a 1/2 cut-off as against the

28-item with a 4/5 cut-off could therefore be ascertained. The data from the Perth community study also allowed a comparison of this population with a disaster-affected group on the four subscale scores.

## Study 2

### Subjects

Eighty victims who had sustained major losses in the disaster were randomly selected from the master register and contacted by the government welfare agency. Subjects were selected according to the following criteria; (1) first-degree relative killed in the disaster, (2) home destroyed, (3) suffered major property losses affecting income and/or, (4) sustained severe injury in the disaster.

### Instruments

Each subject completed the 28-item GHQ and was administered the DIS by a trained interviewer. It was speculated that in such a population the ability of the GHQ to distinguish ongoing social distress and psychiatric disorder would be especially tested. Thus, the GHQ was validated against the DIS to ensure that the GHQ was detecting diagnosable psychiatric disorder and not continuing social disadvantage and distress due to the impact of the disaster. Furthermore, the possibility existed that the chronicity of disorder in this population could lead to an unacceptably high rate of false-negatives because the wording of the GHQ asks subjects to judge their current psychological state against how they might usually be (Goodchild and Duncan-Jones 1981).

## Results

### Study 1

#### *The sample and impact of the disaster*

Demographic information about the population is presented in a previous report (Clayer et al. 1985). A total of 1,023 households replied, with a double response being received from 503, resulting in 1,526 questionnaires being returned. The response rates included 21 (25%) of the 85 people who were admitted to hospital, 11 people who had a first-degree relative killed (maximum 39%) and 261 of the 385 homes destroyed (the equivalent of 45% return rate, allowing for two questionnaires being returned from 49% of the responding

households). In addition, 143 (9%) reported the death of close friends, with 27 (2%) of the victims having lost three or more friends. Property damage, including the loss of homes, was experienced by 1,159 (76%) of the victims and another 347 (23%) had their property threatened but had defended it successfully. The property damage had affected the livelihood of 836 (55%) of the respondents, with 493 farmers having had livestock killed.

### *Psychiatric morbidity*

The mean GHQ score for the total sample was 5.6 (SD = 6.8) and 42% were defined as probable cases using Goldberg's recommended 4/5 cut-off. On the total score, significantly more women were defined as cases (46%) than were men (37%,  $\chi^2 = 12.3$ ;  $p \leq 0.001$ ). On the subscale scores, women demonstrated significantly higher levels of morbidity except on the social dysfunction scale (Table 1).

### *Comparison with other epidemiological data*

Table 2 presents a comparison of Australian epidemiological studies that have used the GHQ. The results show that the disaster victims had significantly higher levels of psychiatric morbidity than any of the previously surveyed communities, with probable disorder ranging from 13% to 31% for men and from 19% to 36% for women. This level of morbidity ranged from 1.2 to 2.8 times greater for men and from 1.3 to 2.4 times greater for women. It was also found that the results pertaining to the Newcastle earthquake (Carr et al. 1991) are lower than those found in the bushfire sample.

However, as indicated in Table 2, the version of the GHQ varied between the epidemiological studies. Using the original data tape of the Perth community data, a caseness rate of 21% was calculated using a 4/5 cut-off with the 28-item version. This compared with a caseness rate of 21% using a 1/2 cut-off with the 12-item version and a caseness rate of 17% using a 3/4 cut-off with the 20-item version. Thus, the 12-item version of the GHQ would appear to give similar

**Table 1** GHQ data for the Ash Wednesday bushfire victims

GHQ	Males (n = 744)		Females (n = 704)		Comparison of male and female scores Mann-Whitney U test
	Mean	SD	Mean	SD	
Somatic	1.4	(1.9)	1.8	(2.2)	247,828*
Anxiety	1.8	(2.4)	2.4	(2.6)	241,953*
Social dysfunction	1.3	(2.0)	1.5	(2.2)	261,501
Depression	0.4	(1.2)	0.7	(1.5)	247,354*
Total score	4.9	(6.3)	6.4	(7.1)	233,045*

\* $P \leq 0.001$

**Table 2** Comparison of GHQ caseness rates between Ash Wednesday bushfire victims and other large Australian epidemiological studies

Study	GHQ	(Cut-off)	n	Total %	Male %	Female %
Ash Wednesday victims (South Australia)	28	(4/5)	1,526	42	37	46
Comparison group (South Australia)	28	(4/5)	100	14	6	8
Newcastle earthquake: more damage	12	(1/2)	2,115	29	<sup>a</sup>	<sup>a</sup>
(Carr et al. (1991): less damage)	12	(1/2)	801	24	<sup>a</sup>	<sup>a</sup>
Australian Health Survey (Australian Bureau of Statistics 1978)	12	(1/2)	25,354	28**	<sup>a</sup>	<sup>a</sup>
Perth Community Sample	60	(11/12)	2,324	16**	13**	19**
(Finlay-Jones & Burvill, 1977)	28	(4/5)	2,324	21	<sup>a</sup>	<sup>a</sup>
St Mary's Health Survey (Klugman 1975)	12	(1/2)	519	31**	24 <sup>c</sup>	36*
NSW Health Care Survey (Shiraer & Armstrong 1978)	12	(1/2)	2,900	27**	27**	28**
Gosford/Wyong District						
Illawarra District	12	(1/2)	3,600	24**	18**	26**
Botany Bay (Andrews et al. 1977)	20	(3/4)	863	24**	<sup>a</sup>	<sup>a</sup>
Canberra (Henderson et al. 1979)	12	(1/2)	735	30**	31**	30* *

<sup>a</sup>Data allowing breakdown by gender not available

\* $P \leq 0.01$  ( $\chi^2$ ,  $df = 1$ ); \*\* $P \leq 0.001$  ( $\chi^2$ ,  $df = 1$ )

prevalence estimates to the 28-item version. In contrast, the 20- 30- (18%), 60-item (16%) forms gave slightly lower prevalence estimates (Burvill and Knuiman 1983). Therefore, the error introduced by using different versions of the GHQ in different comparison groups does not appear to be major.

#### *Comparison of bushfire sample and comparison sample of subscales*

When the Perth community 28-item GHQ data were compared with the Ash Wednesday bushfire sample, the bushfire group (42%) had twice the prevalence of probable cases ( $\chi^2 = 148$ ;  $P \leq 0.001$ ). Both men (37%) and women (46%) who experienced the bushfires were more likely to be psychiatric cases than the Perth sample of men (17%;  $\chi^2 = 69$ ;  $P \leq 0.001$ ) and women (24%,  $\chi^2 = 84$ ;  $P \leq 0.001$ ). The increased symptom scores in the disaster victims occurred on all four subscales of the 28-item GHQ (Table 3). The women in the Perth sample scored significantly lower than the disaster-affected women on all the subscales. In contrast, the men did not score significantly higher on the depression subscale. In general, the greatest increases occurred on the anxiety subscale.

#### Study 2

##### *The sample and impact of the disaster*

The 43 subjects who agreed to be interviewed (response rate = 54%), included 6 victims who had suffered the death of a spouse or a child, 4 who had had a close

friend killed, 13 whose homes had been destroyed, two who had sustained severe burns and 26 who had suffered a major loss of income.

##### *Psychiatric morbidity*

Ten (23%) victims had a score of greater than 4 on the 28-item GHQ when interviewed 20 months after the disaster. Six people were diagnosed as being currently disordered according to the DIS, with five receiving the diagnosis of PTSD, three of whom also had a major depressive disorder, and a sixth subject had this latter diagnosis alone. A detailed examination of the DIS interviews revealed that on clinical grounds another three subjects would have received a diagnosis of a PTSD. Furthermore, two of these latter subjects had subsequently been referred to the first author (A.McF.) for treatment of this disorder. Another six subjects received a positive diagnosis of psychiatric disorder that had begun after the disaster but had resolved before the time of the interview with or without treatment. The specificity of the GHQ was 86% and the sensitivity was 83% using the strict DIS computer scoring. If the clinical reclassification of PTSD based on the referred diagnosis was imposed, the specificity rose to 97% and the sensitivity to 89%.

#### **Discussion**

The results demonstrated that the prevalence of psychiatric morbidity 12 months after the Ash Wednesday bushfires was double that reported in Australian community studies that offer valid comparison data

Table 3 Comparison of re-analysed Perth community study 28 - item GHQ data (Finlay-Jones and Burville 1977) and the 28 - item GHQ data Bushfire sample

GHQ	Total sample			Males			Females							
	Perth (n = 1,439)		Bushfire (n = 1,526)	Perth (n = 678)		Bushfire (n = 744)	Perth (n = 761)		Bushfire (n = 704)					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	U <sup>a</sup>			
Somatic	0.8	(1.5)	1.6	(2.1)	0.7	(1.3)	1.4	(1.9)	0.9	(1.4)	213,277*	1.8	(2.2)	224,209*
Anxiety	0.8	(1.5)	2.1	(2.5)	0.7	(1.4)	1.8	(2.4)	0.9	(1.6)	212,940*	2.4	(2.6)	198,230*
Social dysfunction	0.6	(1.3)	1.5	(2.1)	0.6	(1.3)	1.3	(2.0)	0.7	(1.4)	252,675*	1.5	(2.2)	223,201*
Depression	0.3	(1.1)	0.5	(1.4)	0.3	(0.9)	0.4	(1.2)	0.4	(1.1)	204,994	0.7	(1.1)	252,150
Total score	2.5	(4.4)	5.6	(6.8)	2.2	(4.0)	4.9	(6.3)	2.8	(4.7)	204,994*	6.4	(7.1)	207,089*

\*P ≤ 0.001

<sup>a</sup>Mann-Whitney U test

(Australian Bureau of Statistics 1978; Finlay-Jones and Burville 1977). The Gosford and Illawara communities, for example, are demographically distinct populations, being a commuter/retirement population on one hand and an immigrant industrial labour force on the other (Henderson et al. 1979). In addition, Henderson et al. (1981) point out that the Canberra population had abnormally high levels of neurotic symptoms and may not represent an appropriate control sample. Furthermore, the high scores on the GHQ in the Canberra population did not indicate substantial levels of psychiatric disorder when validated against the PSE, with prevalence estimates of 7.0% being made for males and 11.0% for females (Henderson et al. 1979). In contrast, study 2 indicated that the 28-item GHQ had a high specificity of 86% for a positive psychiatric disorder.

It is difficult to compare the prevalence estimates from this study with other disaster studies because of differences in sampling procedures. For example, Maj et al. (1989) compared rates of morbidity in general practice attenders 4 years after an Italian earthquake between people remaining in the affected community, people who had to be relocated and a control sample. The prevalence rates according to the 30-item GHQ were 55.3%, 55.2% and 47.2%, respectively. An important limitation of these data is that general practice attenders are known to have increased rates of psychiatric morbidity, independent of whether their community has been affected by a disaster. Similar problems exist in interpreting the findings of Sethi et al. (1987) that 22.6% of adult outpatients at government clinics were suffering from mental disorders 4-6 months after the Bhopal gas disaster in contrast to 17.7% in a general health service setting. Such studies of select populations obviously do not allow community prevalence estimates.

Shore et al. (1986) compared a control population with groups who had low and high exposure to the Mt. St. Helen's volcanic eruption. Using the DIS, their data suggested that 9% more men and 20% more women had experienced a diagnosable psychiatric disorder in the high exposure group compared with the controls in the 3 years after the disaster. These levels of morbidity are similar in magnitude to those observed in the victims of the Ash Wednesday bushfires. The losses of the bushfire victims would have meant that most of them would have been categorised as having a high exposure using the Shore et al. (1986) criteria. The longitudinal study of primary school children who had also experienced the bushfire demonstrated a similar doubling of probable caseness rates (McFarlane et al. 1987). The results suggest, therefore, that a doubling of morbidity can be anticipated in both adults and children following a major disaster.

These findings are important because they demonstrate the existence of a pattern of chronic posttraumatic morbidity that represents more than a pattern of transient distress caused by the impact of the disaster.

While each disaster presents a unique set of stressors and care is therefore required in making generalisations (Green 1982), the present findings support the hypothesis that disasters have a substantial impact on the mental health of the affected populations (Quarantelli 1985). In the present study, this level of morbidity existed despite the fact that a special team of welfare workers had been appointed to facilitate the provision of disaster relief with minimal bureaucratic interference. This team had face-to-face contact with all of the registered victims of the disaster and provided crisis intervention counselling to many families and individuals. As well, some victims had consulted a variety of community and mental health providers. Thus, the level of morbidity may have been decreased by these interventions, stressing the size of the adverse impact of these bushfires on the mental health of the affected communities.

In addition, the low rates of divorced/single-parent families and unemployed, as well as the relatively high socioeconomic status of this sample are "protective" factors that would be expected to lower the prevalence rate of disorder in this community (Norris and Uhl 1993; Solomon and Canino 1990; Andrews et al. 1977). It is suggested that these factors support the proposition that this population was not highly vulnerable in terms of demographics, and that this may have decreased the difference in the levels of psychiatric morbidity in the group in relation to the comparison studies. Rather, as previous work has shown (Carr et al. 1995), the extent to which people's lives are disrupted by the disaster and their perception of threat are particularly important "vulnerability" factors that explain psychological distress and morbidity.

A response rate of 50% was achieved, which raises questions about the 50% who did not respond and the bias this may reflect in the data. This issue requires careful consideration, however, the strict confidentiality that was maintained throughout this study made it impossible to identify responders or non-responders and examine further specific features of the sample. Communications received from people who found the questionnaires too upsetting to complete suggest that the non-responding group may have been more adversely affected by their disaster experiences. For example, one respondent wrote "In the evening I can still hear my mate when he was calling to me as he was burning. Your paper stirs up these bad memories, so you can understand why I don't want to answer" (Clayer et al. 1985). Furthermore, the under-representation in the survey sample of people who had sustained major losses and had injuries suggested that vested interest did not play a major role.

The timing of study 1, close to the anniversary of the disaster, raises the possibility that the high rates of morbidity represented an anniversary effect. However, a longitudinal study of a group of fire-fighters involved in containing this disaster has failed to demonstrate an

anniversary effect, rather demonstrating a lower rate of morbidity at 12 months, in contrast to 4 and 29 months after the disaster (McFarlane 1986 a). It is suggested, therefore, that an "anniversary effect" did not explain the level of morbidity found in this study.

Whilst the level of psychiatric morbidity was increased by the impact of the disaster, it is important to note that the majority of the population were not so affected as was the case after the Mt. St. Helen's eruption (Shore et al. 1986). Despite the fact that many subjects were still coping with the practical and emotional stresses of the ongoing effects of the disaster, the findings showed that just over half of the population had a low GHQ score ( $< 4$ ). This demonstrates that the GHQ was not detecting a pattern of non-specific emotional distress or "problems with living" due to the disaster. Rather, it was a specific measure for the detection of diagnosable psychiatric disorder. Although this disorder was chronic in most cases, the GHQ continued to accurately detect its presence, contrary to the prediction of Goodchild and Duncan-Jones (1981). Therefore, the GHQ proved to be a valid instrument for defining the presence of psychiatric disorder in a disaster-affected community.

In line with Breslau and Davis (1987), these findings challenged the view that psychiatric disorder is highly probable in people exposed to a major disaster. The resilience of many people was partially demonstrated in the sample interviewed for the validation of the GHQ (study 2). Four of the six people who experienced the loss of both next of kin and home had developed no diagnosable PTSD. Therefore, it is important to emphasise the moderate size of the increased prevalence of psychiatric morbidity in these disaster victims.

The validity of any conclusions drawn from these data depends upon the GHQ's ability to detect psychiatric morbidity. The validation study (study 2) indicated that the specificity of 86% and sensitivity of 83% of the GHQ against the DIS were adequate, and similar to the 12-item GHQ's ability to detect PTSD (McFarlane 1986 a). The results suggest that a score of greater than 4 in this disaster-affected population was a good predictor of clinically significant psychopathology. Detailed scrutiny of the false-positive and false negative cases, including a discussion with the interviewers (a psychologist and a 4th-year medical student), suggested that the GHQ was a more sensitive measure of clinically significant PTSD than the PTSD module of the DIS. This is in keeping with other studies that suggest that the DIS may have a relatively low sensitivity for detecting anxiety disorders (Katon et al. 1987; Folstein et al. 1985; Von Korff et al. 1987). Furthermore, the diagnosis of PTSD can be difficult because of the predominance of physical symptoms and the tendency of the sufferer to avoid a direct description of the symptoms (McFarlane 1986 b), factors that are not well catered for by the version of the PTSD section of the DIS used in this study.

In conclusion, natural disasters have a substantial impact on the mental health of affected populations. Despite the provision of welfare teams to assist victims and the finding that this population was not a demographically "vulnerable" group, a doubling of psychiatric morbidity was reported. At the same time, it is important to recognise that just over half of the population had low GHQ scores. This demonstrated the resilience of many people who were affected by the fires, even though many people were still reconstructing their lives at the time of the study. These data raise the obvious question about the aetiological relationship between the impact of the disaster and the development of subsequent disorder. This is relevant to the life events literature (McFarlane 1985) investigating the role of adversity in the onset of psychiatric disorder. One important question is the relationship between the pre-existing psychiatric morbidity in a community and the impact of a disaster. The disaster may both precipitate new disorders and exacerbate or modify the symptomatology of those who are already disordered. Furthermore, the increased prevalence of psychiatric morbidity after this disaster and its chronic nature (McFarlane 1986a) suggest that preventative services may have an important role after such events. The degree to which the disaster experience predicts morbidity is an important question as it may define high risk groups who deserve particular attention in any preventative effort. These issues are investigated in another paper.

---

## References

- Andrews G, Schonell M, Tennant C (1977) The relationship between physical, psychological and social morbidity in suburban community. *Am J Epidemiol* 105: 324-327
- Australian Bureau of Statistics (1978) Australian Health Survey 1977-1978. Australian Bureau of Statistics, Canberra
- Breslau N, Davis GC (1987) Post-traumatic stress disorder: the stressor criterion. *J Nerv Ment Dis* 175: 225-264
- Breslau N, Davis GC, Anderski P, Peterson E (1991) Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Arch Gen Psychiatry* 48: 216-222
- Burvill PW, Knuiman MW (1983) Which version of the General Health Questionnaire should be used in community studies. *Aust N Z J Psychiatry* 17: 237-242
- Carr VJ, Carter G, Cubis J et al (1991) Quake Impact Study - interim report. University of Newcastle
- Carr VJ, Lewin TJ, Webster RA, Hazell PL, Kenardy JA, Carter GL (1995) Psychosocial sequelae of the 1989 Newcastle earthquake: I. Community disaster experiences and psychological morbidity 6 months post-disaster. *Psychol Med* 25: 539-555
- Clayton JR, Bookless-Pratz C, McFarlane AC (1985) The health and social impact of Ash Wednesday bushfires: survey of the 12 months following the bushfires of February 1983. Mental Health and Evaluation Centre, South Australian Health Commission, South Australia
- Clayton JR, McFarlane AC, Bookless CL et al (1995) Prevalence of psychiatric disorders in rural South Australia. *Med J Aust* 163: 124-129
- Davidson JRT, Hughes D, Blazer DG, George LK (1991) Post-traumatic stress disorder in the community: an epidemiological study. *Psychol Med* 21: 713-721
- Finlay-Jones RA, Burvill PW (1977) The prevalence of minor psychiatric morbidity in the community. *Psychol Med* 7: 475-489
- Folstein MF, Romanoski AJ, Nestadt G et al (1985) Brief report on the clinical reappraisal of the diagnostic interview schedule carried out at the Johns Hopkins site of the epidemiological catchment area program of the NIMH. *Psychol Med* 15: 809-814
- Gist R, Lubin B (1989) Psychosocial aspects of disaster. Wiley, New York
- Goldberg DP (1978) The manual of the General Health Questionnaire. Nelson, Windsor
- Goodchild ME, Duncan-Jones P (1981) Chronicity and the General Health Questionnaire. *Br J Psychiatry* 146: 55-61
- Green BL (1982) Assessing levels of psychological impairment following disaster: consideration of actual and methodological dimensions. *J Nerv Ment Dis* 170: 544-552
- Green BL, Lindy JD, Grace MC, Leonard AC (1992) Chronic posttraumatic stress disorder and diagnostic comorbidity in a disaster sample. *J Nerv Ment Dis* 180: 760-766
- Helzer JE, Robins LN, McEvoy L (1987) Post-traumatic stress disorder in the general population: findings of the Epidemiologic Catchment Area survey. *N Engl J Med* 317: 1630-1634
- Henderson S, Duncan-Jones P, Byrne DG, Scott R, Adcock S (1979) Psychiatric disorders in Canberra: a standardized study of prevalence. *Acta Psychiatr Scand* 60: 355-374
- Henderson S, Byrne DG, Duncan-Jones P (1981) Neurosis and the social environment. Academic Press, Sydney
- Katon W, Vitaliano PP, Jones JRM, Anderson K (1987) Panic disorder: spectrum of severity and somatization. *J Nerv Ment Dis* 175: 12-19
- Kessler RC, McGonagle KA, Zhao S, Nelson CB et al (1994) Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Study. *Arch Gen Psychiatry* 51: 8-19
- Klugman K (1975) The St. Mary's Health Survey. Health Commission of New South Wales, Sydney
- Koeter MW (1992) Validity of the GHQ and SCL Anxiety and Depression scales: a comparative study. *J Affect Disord* 24: 271-279
- Lima BR, Pai S, Caris L et al (1991) Psychiatric disorders in primary health care clinics one year after a major Latin American disaster. *Stress Med* 7: 25-32
- McFarlane AC (1985) The effects of stressful life events and disasters: research and theoretical issues. *Aust N Z J Psychiatry* 19: 409-421
- McFarlane AC (1986a) Long-term psychiatric morbidity after a natural disaster: implications for disaster planners and emergency services. *Med J Aust* 145: 561-563
- McFarlane AC (1986b) Posttraumatic morbidity of a disaster: a study of cases presenting for psychiatric treatment. *J Nerv Ment Dis* 174: 4-14
- McFarlane AC, Irwin C, Policansky SK (1987) A longitudinal study of the prevalence and phenomenology of psychological morbidity in children due to a disaster. *Psychol Med* 17: 727-738
- Maj M, Starace F, Crepet P et al (1989) Prevalence of psychiatric disorders among subjects exposed to a natural disaster. *Acta Psychiatr Scand* 79: 544-549
- Norris FH (1992) Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. *J Consult Clin Psychol* 60: 409-418
- Norris FH, Uhl GA (1993) Chronic stress as a mediator of acute stress: the case of Hurricane Hugo. *J Appl Soc Psychol* 23: 1263-1284
- Quarantelli EL (1985) An assessment of conflicting views on mental health: The consequences of traumatic events. In Figley CR, (ed) Trauma and its wake: the study and treatment of post-traumatic stress disorder. Brunner/Mazel, New York, pp 173-215
- Raphael B (1980) Primary prevention: fact or fiction. *Aust N Z J Psychiatry* 14: 163-174

- Resnick HS, Kilpatrick DG, Dansky BS et al (1993) Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. *J Consult Clin Psychol* 61: 984-991
- Robins LN, Regier DA (1991) *Psychiatric disorders in America*. Free Press, New York
- Sethi BB, Sharma M, Trivedi JK, et al (1987) Psychiatric morbidity in patients attending clinics in gas affected areas in Bhopal. *Indian J Med Res* 86 [Suppl]: 45-50
- Shiraer N, Armstrong M (1978) Health care survey of Gosford-Wyong and Illawara, 1975. Health Commission of New South Wales, Sydney
- Shore JH, Tatum EL, Vollmer WM (1986) Psychiatric reactions to disaster: the Mt. St. Helen's experience. *Am J Psychiatry* 143: 590-595
- Solomon SD, Canino GJ (1990) Appropriateness of DSM-III-R criteria for posttraumatic stress disorder. *Compr Psychiatry* 31: 227-237
- Tennant C, Hurry J, Bebbington P (1981) The short-term outcome of neurotic disorders in the community - demographic and clinical predictors of remission. *Aust N Z J Psychiatry* 15: 111-116
- Von Korff M, Shapiro S, Burke JD, Teitlebaum M et al (1987) Anxiety and depression in a Primary Care Clinic. Comparison of Diagnostic Interview Schedule, General Health Questionnaire, and practitioner assessments. *Arch Gen Psychiatry* 44: 152-156
- Yehuda R, McFarlane AC (1995) Conflict between current knowledge about PTSD and its original conceptual basis. *Am J Psychiatry* 152: 1705-1713