

THE EFFECTS OF BUSHFIRE DISASTERS ON FIREFIGHTERS
AND THEIR FAMILIES.

Peter Cook, Meredith Wallace (La Trobe University) and
A. McFarlane (Flinders University)

In recent years there has been an increase in carefully documented research into the long term psychological effects of disaster. However there are still only a few studies which have used a quantitative rather than a descriptive approach to the specification of the outcome and of the variables associated with the disaster. There is evidence that some impairment will be found in a percentage of survivors after at least a year or perhaps longer (Gleser, Green & Winget, 1981) but the extent to which findings can be generalised from one disaster to another is open to question.

Not all disasters produce the same amount of stress. There appear to be grounds for distinguishing between man-made and natural disasters (for example it is suggested that lack of damage contributed to chronic aspects of the Three Mile Island accident (Goldsteen & Schorr, 1982)), and Gleser et al. (1981) suggest at least five other dimensions on which disasters may differ, with consequent differences in outcome for the victims; these factors are: (1) the extent of the serious, unexpected life threat to individuals; (2) the degree of bereavement suffered by the victims; (3) prolongation of physical suffering, life threat and lack of normal necessities; (4) extent of displacement or changes in former environment and new modes of living after the disaster; (5) the proportion of the community affected by the disaster and (6) the cause, whether natural or man-made.

The disaster-affected individuals ("victims") can also be differentiated in terms of loss or degree of danger experienced and the category of victim can be widened to include observers and rescuers (eg., Wilkinson, 1983) or rated as primary, secondary, etc., as described by Taylor (Taylor & Frazer, 1981) in his classification of Erebus victims.

It is possible that the proportion of victims who are at risk to experience emotional and psychological problems can be predicted better when the contribution of these factors is better documented. The present study is concerned with the identification of relationships between aspects of a disaster (bushfire) and psychological outcome in a group of volunteer firefighters, all of whom lived in the Macedon region. Four of the factors outlined above were specifically investigated.

In addition, the hypothesis of Gleser et al. (1981) that "spouses will evidence similarity in the nature and extent of their psychopathology" was tested by including the spouses of firefighters in the study. It has been suggested that the coping and adjustment processes of an individual are reflected in everyday and family life (Lazarus, 1981). The family itself has

been depicted as a source of stress or of support (Heller, 1979). Identification of the role of the factors mentioned above in conjunction with the family environment may lead to more effective interventions following disaster.

A study of firefighters in the Country Fire Service of South Australia who fought similar fires at the same time has found that 9 months after the event, 20% (10 out of 50) had developed post traumatic stress disorders (McFarlane & Croft, 1984). While predictions of similar levels of psychological morbidity could be made for the volunteers in the Macedon Country Fire Authority brigades, there are some interesting differences between the groups. The first is that, unlike the S.A. volunteers, the majority of whom came from outside the fire affected region, the Macedon and Mt. Macedon volunteers lived in the area through which the fires burnt, some lost houses and many had houses which had to be defended against the fire. Secondly the area was swept by fire twice in two weeks, and the volunteers had barely been stood down after the first fire before the second one flared up. The third difference is that press reports of the coroner's enquiry were misleading in that they were perceived as unfavourable for the Macedon brigades.

The first of these differences means that the Macedon CFA volunteers are likely to differ from the CFS in terms of three of the dimensions listed above (i.e., the prolongation of physical suffering, lack of normal necessities; the extent of displacement and changes in former environment; and the proportion of the community affected by the disaster), leading to the prediction that the CFA volunteers would show a higher incidence of post traumatic stress disorder. The other differences between the groups could also be expected to increase the stress on the CFA volunteers.

Since the spouses were directly threatened by the fire, their outcome should be affected by all the factors listed above, and some of them would be expected to show some psychopathology. Thus an interaction between the firefighter's and the spouse's impairment may occur, resulting in an enhancement of the firefighter's problems. If this is so, disruption of family interactions should also be evident. To date there has been little investigation of the disruption which families experience following disaster, nor has the contribution of family factors to recovery been thoroughly studied.

The aims of this study were (1) to assess the psychological effects of two severe bushfires on volunteer CFA firefighters, some of whom lost houses and all of whom lived in the district they were defending; (2) to compare measures taken at 1 month and 11 months after the event; (3) to assess the psychological effects on the spouses and families of CFA volunteers 11 months after the fires and (4) to identify environmental and other variables which might account for the psychological state of firefighters, spouses and families, 11 months after the fires.

METHOD

Subjects:

Thirty seven CFA volunteer firefighters, 34 males, 3 females from the Macedon brigade (N=18) and the Mt. Macedon brigade (N=19) responded to an appeal through their brigade Captains to participate in the survey. Response rate was high from the active members of both brigades. (The percentage cannot be specified, as "active membership" was a subjective description supplied by the captains.) Thirty two firefighters were married, 1 was divorced and 4 were single. The spouses or partners of 31 of the firefighters also completed questionnaires and 33 questionnaires for families were completed.

Materials

1. Firefighters questionnaire: this consisted of demographic questions; questions about the perception of public reaction to CFA, and involvement in CFA activities; personal losses; exposure to fire as a CFA volunteer, degree of danger; Impact of events scale + extra questions; life events before and after the fire; 12 item GHQ; questions about health, drug and alcohol taking.
2. Questionnaire for firefighter's spouse: this consisted of demographic questions; questions about perception of public reaction to CFA, involvement of spouse and self in CFA; personal losses; exposure to fire, including danger; Impact of Events + extra questions; life events before and after the fire; 12 item GHQ; questions about health, drug and alcohol taking.
3. Questionnaire for families (firefighter and spouse were asked to fill this in jointly): questions about children and ages, property loss and present living arrangements; reconstruction, including financial assistance; thoughts about future fires, and a family scale of 12 items. The family scale was made up of items which had been found to reflect family disturbance in a study of children following the South Australian fires (McFarlane, personal communication).

Procedure

Questionnaires were taken to a regular meeting of each brigade and handed to volunteers by the experimenters who also spoke briefly about the survey. Questionnaires were treated as confidential and were returned in sealed envelopes to the University or collected by a psychologist research assistant. The time of administration was January, 1984, 11 months after the February bushfires.

Study of CFA less than one month after fires

Within two to four weeks of the second fire (and in one case, before the second fire) 20 members of the Mt. Macedon brigade were interviewed using a semi structured interview, and given the 12 item GHQ and IES scale to complete. Of these, 11 had lost their houses. Fifteen of this group also participated in the follow up study 11 months after the fires. Only the GHQ and IES data are reported here.

RESULTS

No significant differences between the Macedon and Mt. Macedon brigades were found on any major variable, except in answer to the question "Overall have the thoughts and feelings you have had since the fire been a worry to you?" Members of the Macedon brigade gave a stronger affirmative response (sig at .04) than the Mt. Macedon brigade members. Mt. Macedon volunteers also attended meetings significantly more often than did Macedon (17 meetings vs. 5 meetings). There were no significant differences in their response to any of the scales incorporated in the questionnaire (ie., GHQ, Impact of Events, Life events). The data for the two brigades were therefore combined and the means (and SDs) for the firefighters and their spouses on the 12 item GHQ, and IES, Intrusion and Avoidance subscales of the IES and the Life events are shown in Table 1.

TABLE 1
FIREFIGHTERS AND SPOUSES SCORES ON GHQ,
LIFE EVENTS, IES AND SUBSCALES

SCALE	FIREFIGHTER MEAN (S.D.)	SPOUSE MEAN (S.D.)
G.H.Q. (12 item)	2.81 (3.7)	3.13 (3.79)
Life Events		
Before fires	0.50 (9.70)	0.52 (0.81)
After fires	0.78 (1.17)	0.42 (0.81)
Impact of Events	19.5 (17.53)	22.5 (16.75)
Intrusion	12.0 (10.60)	11.9 (9.27)
Avoidance	7.6 (8.30)	10.6 (9.00)

TABLE 2(a)

Comparison of scores on GHQ, IES and subscales on 19
Firefighters less than 1 month and 37 Firefighters 11 months
after the fires.

Scale	Time of testing	
	March 1983 (N=20)	Jan 1984 (N=37)
	Mean (SD)	Mean (SD)
GHQ (12 item)	2.95 (2.91)	2.81 (3.7)
Impact of Events	31.0 (15.08)	19.5 (17.53)
Intrusion	17.65 (6.89)	12.0 (10.60)
Avoidance	13.35(10.17)	7.6 (8.30)

TABLE 2 (b)

GHQ: Frequency of cases above and below the cut-off (4/5)

	March '83.	June '83	Jan '84
Non case	14 (70%)		28 (75%)
Males			
Case	6 (30%)		9 (25%)
Non case	9 (47%)*	9 (24%)#	21 (67%)@
Females			
Case	10 (53%)*	29 (76%)#	10 (32%)@

*Burnt out and not burnt out Macedon women

#Burnt out women

@Firefighters' wives

In Table 2(a) a comparison is made of the scores on the GHQ and IES + subscales for 1 month and 11 months after the fires. While scores on the IES have dropped markedly (mean of 31 to 19.5) there is little difference in the mean GHQ scores (2.95 vs. 2.81).

The number of cases (i.e., those who are considered to show "nonpsychotic psychological impairment") are shown in Table 2(b). Figures for women resident in the Macedon district, obtained at 1 month and 4 months after the fires, are shown for comparison. It will be noted that there is little difference from time 1 to time 2 for firefighters.

Independent stepwise multiple regression analyses were performed for each of the major outcome variables (i.e., firefighters GHQ, spouses GHQ and factors obtained by way of factor analysis of the family scale). Initial inspection and analysis of the data revealed that firefighters' and spouses' own intrusion scores (as measured on the IES) were very highly correlated with their respective GHQ scores. As both constitute outcome variables and because GHQ provides a more adequate description of consequences in terms of symptomatology, it was decided to exclude intrusion scores from the regressions to GHQ, although the intrusion score of the other partner was retained. The multiple regression procedure utilised is essentially conservative in that for inclusion in the equation, each variable must contribute significantly of its own accord.

Firefighters GHQ

The results of the stepwise multiple regression to firefighters GHQ are shown in Table 3. Spouse's GHQ proved to be the best predictor, with the question relating to injury to the firefighter also accounting for a significant proportion of the variance.

Spouses GHQ

Similarly, firefighter's GHQ proved to be the best predictor to spouse's GHQ. Spouse's avoidance, as measured by the IES, also contributed significantly, with higher avoidance being associated with higher GHQ scores.

TABLE 3

STEPWISE MULTIPLE REGRESSION OF VARIOUS
SCORES (EXCLUDING OWN INTRUSION SCORE) TO
FIREFIGHTERS' AND SPOUSES' GHQ

Dependent Variable	Sig. loading variables	Beta	R square change	F	d.f.
F/F GHQ	Spouse GHQ	0.70	0.49	22.67**	1,24
	Sustained injury	0.32	0.10	16.46**	2,23
Spouse GHQ	F/F GHQ	0.70	0.49	19.83**	1,21
	Spouse avoidance	0.36	0.12	15.61**	2,20

Family Scale Factors

The family scale utilised constitutes a new questionnaire based on an earlier version by McFarlane. A reliability analysis of the scale showed that internal consistency was good (standardised item alpha 0.79). A factor analysis was performed to identify more uniform and discrete factors, prior to the multiple regression analysis. The factor analysis identified three factors which are described in Table 4, together with the factor scores for individual variables. Separate stepwise multiple regression analyses were then performed to each factor (Table 5). Firefighter and spouse GHQ scores and both intrusion subscale scores were included in the multiple regression analysis.

TABLE 4
FACTORS OBTAINED FROM A VARIMAX ROTATED
FACTOR ANALYSIS OF THE FAMILY SCALE

<u>Factor 1: Irritable and withdrawn</u>	Factor score coefficients
2 More irritable with each other	.20
5 More withdrawn from each other	.16
6 Avoid discussing upsetting problems	.29
8 Fight more with each other	.21
11 Worry about putting strain on each other	.28
12 Avoid discussing the fire or its effects	.28
<u>Factor 2: Less contact and less enjoyment together</u>	
3 Spend less time together	.39
7 Less contact with friends, relatives	.45
9 Harder to enjoy activities together	.29
<u>Factor 3: Closer</u>	
1 Closer than before	.42
4 Often talk if there is a problem	.43
10 A better sense of goals and values	.40

TABLE 5
STEPWISE MULTIPLE REGRESSION OF VARIOUS
SCORES TO THREE FAMILY FACTORS

Dependent Variable	Significantly loading variables	Beta	R square Change	F	d.f.
Family 1	Spouse avoidance	0.58	0.34	11.59**	1,23
	Reaction of public	-0.49	0.24	12.53**	2,22
	Spouse L/events after	0.40	0.11	7.71**	3,21
	Spouse's previous disasters	-0.25	0.06	4.97*	4,20
	F/F intrusion	0.29	0.06	6.87*	5,19
	F/F major role in unit maintenance	-0.31	0.07	11.53**	6,18
	Working longer hours	-0.33	0.06	20.02**	7,17
Family 2	F/F preoccupied about the fires	0.51	0.26	7.94**	1,23
Family 3	Still living in same family house?	0.45	0.20	5.85*	1,23

Family Factor 1: Irritable and withdrawn.

Seven variables were detected as significant predictors to the first factor from the family scale. In general terms, families who reported higher levels of avoidance, fighting and irritability also showed:

- (i) more avoidance of thinking about the bushfires
- (ii) higher ratings of unfavourability of public reactions to the CFA role.
- (iii) higher spouse report of life events after the fire,
- (iv) less prior experience of bushfires and disasters by the spouse,

- (v) more intrusive thoughts regarding the fires by the firefighter,
- (vi) less involvement in unit maintenance by the firefighter,
- (vii) less likelihood of increases in working hours since the fire on the part of one or both spouses.

Family factor 2: Less contact and less enjoyment together.

The only variable predicting significantly to this factor was the spouse's rating of the firefighters continuing preoccupation with the fire in the preceding three months.

Family factor 3: Closer than before and having shared goals.

The sole variable predicting to this factor was whether the family were resident in the same house since the fires (i.e., whether or not they were burnt out).

DISCUSSION

In general the results indicate that substantial numbers of firefighters and their spouses experienced minor psychological disturbances both soon after the fires and as long as 11 months later (Tables 2(a) and (b)). A strong relationship between the psychological disturbance amongst couples was also evident in that the best predictor of either the firefighter or spouse GHQ was the partner's own GHQ score. This supports Gleser's finding that psychic impairment was intercorrelated to a greater degree than could be accounted for by similar background and disaster experience (Gleser et al., 1981). A number of variables, discussed below, have also been identified as associated with aspects of family functioning.

Inspection of the Impact of Events data for firefighters (Table 2(a)) shows that, as would be expected one month after the bush-fires, extremely high intrusion and avoidance scores were evident, suggesting the presence of post traumatic stress disorder in the firefighters at this time (Horowitz, Wilner, Kaltreider & Alvarez, 1980). Subsequently both intrusion and avoidance scores decreased substantially. However during this time the level of non-psychotic psychological disorder (as indexed by the percentage of cases and non cases according to the GHQ) remained at the original levels (Table 2(b)).

In contrast, comparison between the GHQ scores of the firefighters' spouses at 11 months after the fire and those of an unselected group of Macedon and Mt. Macedon women, one month after the fires, reveals a noticeable decrease in the percentage of cases of psychological disturbance. The percentage of cases in the female sample at one month was 53%, whereas the percentages for firefighters at one month and 11 months, and their spouses at 11 months were all around 30%. While a number of interpretations of these data are tenable, the results are in

accord with a large body of previous research which indicates that females report greater distress following disaster than males (Mellick, 1978). It is generally not "masculine" to report emotional symptoms (Danziger, 1978) but this does not necessarily indicate that emotional disorder is absent.

As noted, the best predictor of either partner's level of psychological disturbance was the other partner's level of disturbance. Such concordance may be related to theories of assortative mating (the joining together of partners with similar levels of emotional stability or health) or interactive models of disturbance (Stuart, 1980). The level of injury sustained by the firefighters was also a significant predictor of their longer term psychological adjustment (Table 3). The injuries sustained appear quite substantial (they include smoke inhalation, skin and eye burns) although treatment was mainly provided by ambulance officers rather than in hospitals or by doctors. An index of self rated danger experienced during the fires did not predict significantly to the 11 month GHQ score but it may be that those who are prepared to report general health symptoms will also report injury more freely. Alternatively, physical injury may provide a tangible reminder for a significant period after the disaster which predisposes individuals to later or more long lasting disturbance.

The other significant predictor of spouses GHQ score was their level of avoidance as measured on the IES scale. Horowitz et al. (1980) noted significant correlations between high avoidance scores and a wide variety of psychological disorders, particularly anxiety disorders. It appears that for the spouses, avoidance of painful reminders of the disaster is associated with continuing psychological disturbance, and this may be related to repression and failure to work through the painful emotional aspects of the experience. On the other hand, spouses who are still disturbed may avoid thinking about the fire, which in itself may contribute further to their disturbance.

The spouses' level of avoidance is also related to Family factor 1 (see below), however there is no significant relationship between spouses GHQ (at 11 months) and this index of family disturbance (Table 5). This suggests that spouse avoidance is differentially related to both the spouse's own disorder and family disturbance, although the mechanisms of these separate associations cannot be fully explained at this point. One possibility is that in some families an avoidant spouse is able to deal with her psychological disorder in some way which limits disturbance to other family members, whereas in other families, particularly those firefighters with high intrusion scores (see below), more widespread family disturbance is evident.

Three factors were identified from the Family scale, two of which appear related to family disturbance, while the third indicates a more benevolent outcome (Table 4). The third factor concerns families who reported being closer and having a better sense of goals since the fires. The only significant predictor

to this factor was whether the family had been burnt out. Beneficial psychological consequences are most commonly reported during the immediate post-disaster utopia period, although evidence of some longer term benefits has been noted elsewhere (Gleser et al., 1981). In the present case, both a unification derived from a sense of guilt about not being burnt out, and a realisation of extreme good fortune may have played a part.

Of the more detrimental family factors identified, Factor 1 proves the most complex to interpret. Perhaps the most striking feature is the apparent mismatch on this factor between high spouse avoidance scores and high intrusion scores for the firefighters. The spouses in the families who score high on this factor are also less likely to have experienced previous disaster (which may provide a degree of stress inoculation) and more likely to report the experience of more disruptive life events since the fires. Firefighters from high scoring families are less likely to be involved in the maintenance of the local CFA unit, and either one or both partners is less likely to be working more since the fires. High scoring families also rate public reaction following the inquests as more negative than do less disturbed families.

Although a variety of interpretations of this factor are possible, a picture emerges of a somewhat inward looking family who are highly sensitive to external events and encountering (according to the spouse) more negative life events. The spouse in such families tends not to have experienced disasters, (is probably younger), and avoids thinking about the fires, whereas the firefighter rates himself as being somewhat preoccupied with it. The irritability, fighting and avoidance within such families seems likely to be related to the different coping styles of husband and wife, and perhaps an inability to discuss or deal with such differences.

The final factor from the family scale (Family factor 2) concerned lack of time for contact and enjoyment together or social activities. The significant predictor was the spouse's rating of the firefighter as being continually preoccupied with the fire in the preceding 3 months. Interpretation is difficult, beyond suggesting that this preoccupation interferes with family activities.

Conclusions and Implications

Although the present results are preliminary some potentially interesting findings are apparent. Evidence has been presented which indicates that psychological disorder may continue to be manifested for at least 11 months after the disaster. Furthermore, psychologically disturbed individuals are particularly likely to have spouses with similar levels of disturbance. The reasons for this are not obvious from the present study. Firefighters who report physical injury and spouses who avoid thinking about the fires tend to be most likely to show psychological impairment. Both of these factors may be significant

when designing postdisaster interventions and perhaps psychological interventions should be aimed at these individuals. Injured firefighters are easily identified, and the intervention may reduce trauma.

It may be possible to design interventions which encourage discussion of the experience of the disaster and which may facilitate spouses who would otherwise avoid this working through of painful emotional experiences. These speculative suggestions have the advantage of being in accord with common clinical wisdom.

Surprisingly, the level of psychological disturbance of the firefighter and spouse did not predict significantly to family disruption although a number of other factors did. Of particular importance is an apparent mismatch between the coping styles utilised by the different partners, particularly in dealing with thoughts about the fires. This seems to indicate that rather than absolute levels of individual disturbance, it is the ongoing interaction patterns between partners which contribute to the harmony or lack of it within the family. If evidence accumulates that family disruption following disaster is significant and has detrimental long term consequences, it would seem prudent that disaster management should include family based therapy approaches.

REFERENCES

- Danziger, K. 1978. Socialisation. Harmondsworth: Penguin.
- Gleser, G.C., B.L. Green & C. Winget, 1981. Prolonged Psychosocial Effects of Disaster, N.Y.: Academic.
- Goldsteen, R. & J.K. Schorr, 1982. The long-term impact of a man-made disaster: An examination of a small town in the aftermath of the Three Mile Island Nuclear Reactor Accident. Disasters 6 50-59.
- Heller, K. 1979. The effects of social support: prevention and treatment implications. IN: Goldstein, A.P. & F.H. Kainfer, Maximising Treatment Gains: Transfer Enhancement in Psychotherapy. N.Y.: Academic.
- Horowitz, M.J., N. Wilner, N. Kaltreider, W. Alvarez. 1980. Signs and symptoms of posttraumatic stress disorder. Arch. General Psychiatry, 37, 85-92.
- Lazarus, R.S. 1981. The stress and coping paradigm. In C. Eisdorfer, D. Cohen, A. Kleinman & P. Maxim (Eds.), Models for clinical psychopathology. N.Y.: Spectrum.
- McFarlane, A.C. & G. Croft. 1984. Firefighters and Ash Wednesday. Paper given at the Human Behaviour in Disaster Workshop, Australian Counter Disaster College, April.
- Melick, M.E. 1978. Self reported effects of a natural disaster on the health and well being of working class males. Crisis Intervention, 9, 12-31.
- Stuart, R.B. 1980. Helping Couples Change: A social learning approach to marital therapy. N.Y.: The Guilford Press.
- Taylor, A.J.W. & Frazer, A.G. 1981. Psychological Sequelae of Operation Overdue following the DC10 crash in Antarctica. No.27, Victoria University Pub. Psychology, Wellington.
- Wilkinson, C.B. 1983. Aftermath of a Disaster: The collapse of the Hyatt Regency Hotel skywalks. Amer. J. Psychiatry, 140, 1134-9.