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The Aetiological Importance of Stressful Life Events

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Summary: Despite a large research effort, there is still some doubt whether life events can increase the rate of psychiatric morbidity. It is argued that this doubt arises from a confusion between measures of goodness of fit and measures of causal importance. The distinction between these types of measures is discussed.

Epidemiological studies of life events and psychiatric cases are reviewed. It is argued that, in general, 32 per cent of psychiatric cases can be attributed to stressful life events. Within female samples, approximately 41 per cent of psychiatric cases can be attributed to life events. It is suggested that the effect of specific types of events on specific psychiatric disorders may be of even greater importance.

For over a decade, research workers have attempted to demonstrate that stressful life events produce psychological disturbance (e.g. Paykel *et al,* 1969; Brown *et al,* 1975; Brown and Harris, 1978). The demonstration of an important effect would have profound significance for the clinician and for his understanding and treatment of patients. However, even committed research workers have argued that the influence of life events may be small (e.g. Lin *et al,* 1977; Andrews and Tennant, 1978; Miller and Ingham, 1979; Cochrane and Sobel, 1980). This position was clearly enunciated by Andrews and Tennant (1978), "The size of the association between life events and depression or schizophrenia is small, accounting for less than 10 per cent of the variance and unlikely to have clinical or preventative importance" (p. 547). It will be argued that this view is invalid and that it arises from a confusion between measures of goodness of fit (e.g. variance explained) and measures of causal importance (e.g. slope of a regression line).

Blalock (1964) distinguished between measures of goodness of fit and measures of causal importance. He indicated that a large correlation (i.e. high variance explained) merely indicates that the level of causal impact has been estimated accurately. A large correlation can occur whether life events have a slight or dramatic effect on psychological well-being. It is also the case that a small correlation can occur whether life events have a slight or a dramatic effect on psychological well-being. In the first case the magnitude of the impact is accurately estimated, while in the second case it is poorly estimated. To distinguish between a slight effect and a dramatic effect requires another measure.

The inadequacy of variance explained as a measure of causal impact can be highlighted by considering the impact of smoking on lung cancer. The impact of smoking on lung cancer rates is generally regarded to be large (Doll and Peto, 1976). Calculation of the variance explained by the association between smoking and lung cancer (e.g. Doll and Peto, 1976; Table III), indicates that the association only explains 0.003 per cent of the variance. This arises because variance explained reflects the accuracy with which it can be predicted that an individual smoker will develop lung cancer. Although few non-smokers develop lung cancer, it is also the case that many smokers do not develop the disease. It is difficult, therefore, to predict which individuals will succumb to this disease. This does not, however, imply that smoking is not an important cause of lung cancer. Other measures must be considered.

Several measures of causal impact are available. These include slopes (Blalock, 1964), brought forward time (Brown *et al,* 1973) and the epidemiological concepts of relative risk (Armitage, 1971; Paykel, 1978) and population attributable risk percent, (Lilienfeld and Lilienfeld, 1960). Although they are theoretically valuable measures, the first three measures do not provide an immediate sense of the aetiological importance of any putative cause. Population attributable risk percent does provide such a sense and will be focussed upon.

The majority of epidemiological studies of life events and depression have been cohort studies rather than case-control studies. The rate of psychiatric morbidity in these studies has been comparatively

high. Following Lilienfeld and Lilienfeld (1980), population attributable risk percent can be calculated from a standard contingency table in the following way.

	Case	Non case
Life events	a	b
No life events	c	d

$$\text{Population Attributable Risk Percent} = \frac{ad - bc}{(a+c)(c+d)} \times 100 \text{ per cent}$$

Population Attributable Risk Percent indicates the maximum percentage of psychiatric cases that can be directly attributed to the experience of life events (Lilienfeld and Lilienfeld, 1980). (See Appendix).

A population attributable risk percent of 33 per cent would indicate that one-third of the cases detected in the sample could be directly attributed to the experience of life events. The measure can also be interpreted as indicating the percentage of cases that would disappear if all life events were prevented. This measure provides an immediate sense of the importance of life events in terms of the number of cases affected.

The aetiological significance of life events will now be emphasised by calculating population attributable risk percent in a range of samples. The life event literature is extensive. Studies have been excluded from consideration on the basis of three criteria. Firstly, studies that assessed life events using checklist procedures rather than the more acceptable interview procedures were excluded (Brown, 1974). Secondly, studies that failed to exclude life events that may have been caused by the subject's symptoms (i.e. non-independent events) were not considered. Thirdly, certain studies were necessarily excluded because they did not provide the information required to carry out the calculations.

The values of population attributable risk percent for the selected studies are in the Table.

For comparison estimates of variance explained are also provided (Reynolds, 1977).

The first two studies, which considered mixed sex samples, converged to suggest that about a third of the detected cases could be directly attributed to the experience of stressful life events. The variance explained by the relationship was low, however, implying that it would be difficult to predict which respondents would become cases.

The next group of studies were concerned with female subjects. The mean value of the Population attributable risk percent statistic was higher than that obtained in the mixed samples, with estimates ranged between 35 per cent and 54 per cent. On average, about two fifths of the cases could be attributed to the experience of life events. The variance explained by the relationship was modest, yet double that explained in the mixed sex samples. Therefore, within a sample composed exclusively of women, not only can a higher

TABLE

Study characteristics with population attributable risk per cent and variance explained

Study	Sample	Events	Disorder	Population attributable risk per cent	Variance explained
Bebbington *et al* (1981)	Mixed sex	General life events	Psychiatric morbidity*	34%	8%
Cooke (1981)	Mixed sex	General life events	"Anxiety Depression"	29% Mean = 31.5%	5%
Brown & Harris (1978)	Female	General life events	Psychiatric morbidity	54%	9%
Bebbington *et al* (1981)	Female	General life events	Psychiatric morbidity	37%	10%
Brown & Prudo (1981)	Female	General life events	Psychiatric morbidity	35%	22%
Cooke (1981)	Female	General life events	"Anxiety depression"	37%	10%
Costello (1982)	Female	General life events	Psychiatric morbidity	40%12% Mean = 41%	
Finlay-Jones & Brown (1981)	Female	'Danger events'	Anxiety	72%	25%
	Female	'Loss events'	Anxiety	5%	0%
	Female	'Danger events'	Depression	37%	10%
	Female	'Loss events'	Depression	58%	23%

*Psychiatric morbidity: expressed according to Brown's definition of a psychiatric "case" (Brown and Harris, 1978).

proportion of cases be attributed to the experience of life events, but also it is easier to predict which individual will become a case. The well established higher rate of minor affective disorder in women (Weissman and Klerman, 1977) may be parsimoniously explained in terms of their particular susceptibility or sensitivity to life events.

The studies so far considered suggest that about a third of cases can be directly attributed to the experience of stressful life events. Given that psychiatric morbidity is multiform and has many causes, the demonstration that over a third of cases can be directly attributed to a heterogeneous group of life stresses seems to confirm the clinical importance of such experiences. More powerful effects, however, may exist.

Despite recent statements to the contrary (Andrews and Tennant, 1978; Brown *et al*, 1979; Tennant *et al*, 1981), life events may not have a general effect but rather particular types of events may have causal significance for particular types of cases (Paykel *et al*, 1969; Cooke, 1981; Cooke and Greene, 1981; Grant *et al*, 1981; Bebbington *et al*, 1981; Finley-Jones and Brown, 1981; Miller and Ingham, 1983).

The nature and magnitude of these more specific relationships are well illustrated by the results of Finlay-Jones and Brown (1982) (see Table). These authors empirically distinguished between anxiety cases and cases of depression. In addition, they divided stressful life events into 'loss' events and 'danger' events (i.e. events that might entail a significant degree of unpleasantness in the future). Calculation of the population attributable risk percent statistic suggests that almost three quarters of their cases of anxiety could be directly attributed to the experience of 'danger' life events; while only one-twentieth could be attributed to the experience of 'loss' events. When depression was considered, almost three-fifths of the cases of depression could be directly attributed to the experience of 'loss' events. Particular types of events appear to have aetiological significance for particular types of psychiatric disorder. By examining these more specific relationships, the clinical importance of stressful life events is emphasised.

In conclusion, it would appear that stressful life events in general have a significant role in a third of psychiatric disorders in the community. When particular types of neurotic disorder are considered, perhaps two-thirds of cases can be attributed to the experience of particular types of life events. The clinical importance of life events cannot, therefore, be ignored. Previous statements to the contrary have been based on a misunderstanding of the variance explained statistic.

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Appendix

Calculation of the Population Attributable Risk Percent from a 2 × 2 contingency table constructed from a cohort study

	Case	Non Case	
Life event	a	b	a + b
No life event	c	d	c + d
	a + c	b + d	N = a + b + c + d

$$\text{Population attributable Risk percent} = \frac{\text{Rate of cases in population.} - \text{Rate of cases in* population if all life events were prevented}}{\text{Rate of cases in population}} \times 100$$

$$= \frac{\frac{(a+c)}{N} - \frac{c}{(c+d)}}{\frac{(a+c)}{N}} \times 100$$

$$= \frac{(a+c)(c+d) - c(a+b+c+d)}{(a+c)(c+d)} \times 100$$

$$= \frac{ad - bc}{(a+c)(c+d)} \times 100$$

*I.E. The rate of cases in the no life event group.

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