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# Life Events, Stress, and Illness

Judith G. Rabkin and Elmer L. Struening

Studies relating social factors and life events to illness appear with remarkable regularity in the major psychological, psychiatric, psychosomatic, and sociological journals, and to a lesser extent in those of clinical medicine and epidemiology. While some of these publications derive from the cumulative efforts of investigators who have worked in this field for many years, concern has been expressed that many recent studies repeat both the findings and the flaws of earlier ones, delaying a hierarchical growth and development of knowledge in the field. Accordingly, there is a need for critical evaluation of this literature, taking in issues of method as well as content. In this article our goals are (i) to review selectively the research literature on the relations of life events, stress, and the onset of illness; (ii) to delineate trends in its development; (iii) to evaluate the conceptual and methodological approaches employed; (iv) to identify major variables mediating the impact of stressful events on individuals and groups; and (v) to recommend more comprehensive approaches to substantive issues.

Despite historical recognition of the predisposing role of social factors in the onset of illness, it is only during the last 40 years that scientists have attempted to study these phenomena systematically. In 1936 Hans Selye articulated his concept of stress as the "general adaptation syndrome," a set of nonspecific physiological reactions to various noxious environmental agents (*1*). This formulation was largely responsible for popularizing the concept of stress in the scientific

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vocabulary of medicine, and it initiated an era of research and theoretical development conducted with accelerating enthusiasm on an international scale in numerous branches of the medical and later the social sciences. Also in the 1930's Franz Alexander and his psychoanalytic colleagues in Chicago became interested in relating personality characteristics to selected organic syndromes within the framework of psychosomatic theory. Development of the stress and psychosomatic models of illness has proceeded apace, with a gradual convergence of interest and assumptions so that today stress research and psychosomatic research are to some extent overlapping.

The notion of socially induced stress as a precipitating factor in chronic diseases is gaining acceptance among a wide spectrum of scientists. It is becoming recognized that stress can be one of the components of any disease, not just of those designated as "psychosomatic." As Dodge and Martin (*2*) have expressed it, "the diseases of our times, namely the chronic diseases, are etiologically linked with excessive stress and in turn this stress is a product of specific socially structured situations inherent in the organization of modern technological societies." Even susceptibility to microbial infectious diseases is thought to be a function of environmental conditions culminating in physiological stress on the individual, rather than simply of exposure to an external source of infection (*3*).

In the formulation of a revised etiological model, illness onset is generally associated with a number of potential factors, including the presence of stressful environmental conditions, perception by the individual that such conditions are stressful, the relative ability to cope with or adapt to these conditions, genetic predisposition to a disease, and the presence of a disease agent. In this context the stress concept does not only explain why some people are more prone to illness than others. Stress, like anxiety, is a broad and general concept describing the organism's reactions to environmental demands. Its utility derives from its role in identifying productive lines of research on the etiology of disease, encompassing external events that influence individuals and populations and also their appraisals and interpretations of such events. Accordingly, we will turn to a consideration of the body of research that has focused on the correspondence between life changes, stress, and illness onset.

In the following review we limit our attention to life changes of a primarily personal nature. Changes caused by widespread social processes also heighten the individual's vulnerability to stress and stress-related diseases, but we shall consider only life events which are experienced primarily on an individual level, such as changes in family status or occupation.

## Definitions

We consider the following sequence of conditions: social stressors, mediating factors, stress, onset of illness. In the present context the term "social stressors" refers to personal life changes, such as bereavement, marriage, or loss of job, which alter the individual's social setting. A more specific definition is proposed by Holmes and Rahe (*4*), who define as social stressors any set of circumstances the advent of which signifies or requires change in the individual's ongoing life pattern. According to this conception, exposure to social stressors does not cause disease but may alter the individual's susceptibility at a particular period of time and thereby serve as a precipitating factor.

"Mediating factors" are those characteristics of the stressful event, of the individual, and of his social support system that influence his perception of or sensitivity to stressors. Some are long-term predisposing factors which heighten the individual's risk of becoming ill, such as high serum cholesterol in relation to myocardial infarction. Others may render the individual less vulnerable to stress, such as prior experience with the stressor. In general, consideration of mediating variables contributes to an understanding of differential sensitivities to social stressors.

"Stress" is the organism's response to stressful conditions or stressors, consisting of a pattern of physiological and psychological reactions, both immediate and delayed. "Onset of illness" is defined by the appearance of clinical symptoms of disease.

"Predisposing factors" are long-standing behavior patterns, childhood experiences, and durable personal and social characteristics that may alter the susceptibility of the individual to illness. "Precipitating factors," in contrast, influence the timing of illness onset; the term refers for the most part to more or less transient changes in current conditions or characteristics, and it is such changes that constitute our present subject of inquiry. "Chronic disease" refers here very generally to syndromes which are of long duration and are non-infectious. It is the chronic diseases rather than the acute, infectious ones that are usually thought to be particularly influenced by the experience of stress.

## Life Events Research

The role of stressful life events in the etiology of various diseases has been a field of research for the last 25 years. Derived from William B. Cannon's early observations of bodily changes related to emotions and Adolph Meyer's interest in the life chart as a tool in medical diagnosis, the field was first given formal recognition at the 1949 Conference on Life Stress and Bodily Disease sponsored by the Association for Research in Nervous and Mental Diseases. Since then several groups of investigators have adopted this general framework in independent long-term projects.

In general, the purpose of life events research is to demonstrate a temporal association between the onset of illness and a recent increase in the number of events that require socially adaptive responses on the part of the individual. The impact of such events is presumed to be additive; more events are expected to have greater effect. The underlying assumption is that such events serve as precipitating factors, influencing the timing but not the type of illness episodes. Onset of psychiatric as well as physical disorders and accidents have been studied in both retrospective and prospective designs within the life events framework.

Most investigators working in this field have adopted in original or modified form a 43-item checklist developed by Holmes, Rahe, and their colleagues. The checklist items are intended to represent fairly common situations arising from family, personal, occupational, and financial events that require or signify change in ongoing adjustment. Scores on the first version, known as the Schedule of Recent Experience (SRE), consisted of the number of items checked. Subsequently, weights were assigned to each item based on ratings by a standardization sample of judges who were asked to rate the life events "as to their relative degree of necessary readjustment . . . the intensity and length of time necessary to accommodate to a life event" (*5*). On this scale, known as the Social Readjustment Rating Scale (SRRS), death of spouse, for example, is weighted at 100 (the highest point on the scale), marriage at 50, change in recreation at 19, vacation at 12. This and comparable checklists, usually covering the previous 6 to 24 months, are typically used as the mea-

sure of stressful life events. Modified forms have been developed for specific populations such as children, college students, and athletes.

The most elaborate and extensive program of life events research has been conducted by Rahe, Holmes, Gunderson, and their colleagues. Their work, originally based largely on American naval shipboard personnel, has been extended on an international basis to other naval samples and to diverse civilian groups, and has evoked considerable comment in the literature, both positive and negative. This brief description of their overall approach and representative findings is intended to illustrate the kinds of research and major issues and problems in the field.

In their early retrospective studies, Rahe and his colleagues (*6*) asked over 2000 navy personnel to report their life changes and histories of illness during the previous 10 years. Number of illness episodes was related to scores on the SRRS; these scores are referred to as life change units or LCU's. In general, according to these investigators, those who recorded fewer than 150 LCU's for a given year reported good health for the following year; of those with annual LCU's between 150 and 300, about half reported illness in the next year; and when annual LCU scores exceeded 300, as they did for a small proportion of the respondents, illness followed in 70 percent of the cases, and furthermore tended to entail multiple episodes.

In prospective studies of 2500 American naval personnel aged 17 to 30, life events that occurred in the 6 months prior to shipboard tours of duty were compared with shipboard medical records of the 6-month cruise. Respondents were grouped into quartiles based on their precruise LCU scores, and mean rates of illness were computed for each group. Those in the first quartile had a mean of 1.4 recorded illnesses, those in the fourth quartile 2.1 recorded illnesses, a statistically significant difference. Similar results were obtained with a sample consisting of 821 Norwegian sailors (*7*) and in a study of the entire crew of 1005 men on a warship on combat duty off Vietnam (*8*).

Numerous other studies by various investigators have similarly shown associations between number and intensity of life events and the probability of specific illnesses in the near future [see (*5*) or (*6*) for extensive lists of references]. In many of these studies data about life events and illness episodes were gathered from large, heterogeneous samples by means of questionnaires in conjunction with medical records. In addition to military personnel, employees of large corporations and clinic or hospital patients have been popular subjects in retrospective studies because of the availability of long-term records.

In both retrospective and prospective investigations, modest but statistically significant relationships have been found between mounting life change and the occurrence or onset of sudden cardiac death, myocardial infarctions, accidents, athletic injuries, tuberculosis, leukemia, multiple sclerosis, diabetes, and the entire gamut of minor medical complaints (*6, 9*). High scores on checklists of life events have also been repeatedly associated with psychiatric symptoms and disorders, and such scores have been found to differ between psychiatric and other samples (*10, 11*).

It has been further noted that life events may be related to the course of illness and recovery, whatever the etiology of the primary disease (*12*). In addition, periodic analyses of life events may serve to monitor and help predict the course of illness, as illustrated in a post-hospital follow-up of mental patients by Michaux *et al.* (*13*).

## Statistical Issues

Is it, then, reliably established that stressful life events commonly precede the onset of a wide variety of physical and psychiatric disorders in populations? As presented in the literature, the results are impressive. Their sheer number, the variety of populations studied, and the range of disorders implicated together suggest that this is a useful and meaningful procedure for predicting illness and, more generally, for learning more about vulnerability to illness. However, closer scrutiny of methodological and theoretical aspects of the research, as well as the actual data that have been reported, uncovers a host of serious issues. These are attracting increasing attention both from critics of the life events approach and from investigators who use the method.

The most immediate issue, and one which has received only cursory attention from investigators in this field, concerns the size and practical significance of the correlation between number and nature of life events and subsequent illness episodes. The vast majority of life events studies have, until very recently, relied on statistical methods of the most rudimentary nature to analyze this relationship. Between-group differences are often reported only in percentages, or else exclusively in terms of statistical significance (*P* levels). Given the very large sample sizes characteristic of life events research, even very small correlations of no practical utility may pass tests of statistical significance.

Reports of obtained correlation coefficients are often conspicuously missing. When present, they are typically below .30, suggesting that life events may account at best for 9 percent of the variance in illness. In Rahe's naval data, coefficients of correlation between life events and illness were consistently around .12 (*7*), and other investigators have reported equally low, albeit statistically significant, correlations (*11, 14, 15*). Similarly, when statistically significant differences in illness rates are reported for groups classified in terms of prior life event scores, or groups of differing health status are compared with respect to number of prior life events, attention is often focused exclusively on group means. Variability of scores within groups tends to be overlooked, even when it is extreme, as observed by Wershow and Reinhart (*16*). In practical terms, then, life events scores have not been shown to be predictors of the probability of future illnesses.

## Psychometric Issues

It seems likely that stronger relationships between life events and illness episodes might be obtained if the psychometric properties of the measuring instrument were improved and the outcome criteria refined. Although few studies of the reliability and validity of life events checklists have been published, available evidence suggests weaknesses in both these respects. Rahe (*7*) reports correlations ranging from .26 to .90 in test-retest reliability of the SRRS. He attributes such wide variation to variations in intervals between questionnaire administration, differences in sample characteristics, and complexity of wording used in the questions. As Sarason *et al.* (*17*) have concluded, by any reasonable standard the reliability of the SRE is low.

Rahe *et al.* (*7*) report that wives' independent scores of their husbands' recent life changes show correlations with the husbands' self-reports ranging from .50 to .75. Other questions about validity concern respondents' errors of omission or commission and definition of the criteria of illness with which checklist scores are correlated. Brown (*18*) has referred to the problem of "retrospective contamination" where respondents may

exaggerate past events from a need to justify subsequent illnesses. He cites a study of mongolism, published in 1958 before chromosomal abnormalities were associated with the syndrome, which "demonstrated" the etiologic importance of stressors of the mother during pregnancy. On the other hand, Rahe (*7*) reported that in studies of patients with coronary heart disease where recent life changes were gathered both by questionnaire and interview, the patients rarely if ever listed life changes in the questionnaires that were not substantiated in the interviews.

Another form of contamination that may be a more significant source of error is that a given life event and an illness perceived or reported shortly thereafter may be products of the same phenomenon, so that one cannot be said to distinctly precede or precipitate the other. This problem may arise when the cause and the effect of a life event are both at least a partial result of the actor's behavior, as, for example, in the case of a college student who drops out of school and then manifests psychiatric symptoms. Divorce can be regarded as a life change contributing to depression, but depression in some cases may be a contributory factor in divorce. Although the problem of clearly differentiating between life change and observed outcome has not been ignored in the literature, satisfactory solutions have not yet been achieved. According to Hudgens (*19*), 29 of 43 events on the SRRS checklist are often the symptoms or consequences of illness, and as such are possible sources of contamination.

Several investigators have wondered whether life event checklist scores are actually associated with care-seeking behavior rather than with the onset of illness. Since care-seeking—that is, the fact of a medical record—is frequently used as the operational definition of illness onset in college populations, naval shipboard studies, and elsewhere, the issue is not easily resolved. Cadoret (*20*) and Hudgens (*19*), in their studies of life events and psychiatric depression, both suggest that mounting life changes precipitate psychiatric hospitalization, not the appearance of symptoms. Hudgens noted that while causal relations have been found between stressful life events and worsening of psychiatric conditions already existing, and between life events and subsequent admission to treatment facilities, he has not found it convincingly demonstrated that ordinary life events cause illness. Instead, it may be that life changes lead people to seek medical treatment, that they are equivalent, perhaps, in their etiological role to the availability of medical facilities or funds with which to pay for treatment. Mechanic (*21*), studying the use of outpatient medical services, has also suggested that stress helps to trigger use of a medical facility, if not the development of symptoms. This distinction between illness onset and treatment-seeking behavior may apply to disorders of gradual onset and to those which often go untreated, such as colds and headaches. The issue is, however, irrelevant to the association of life changes with accidents, suicide, mortality rates, and episodes of acute, severe illness such as myocardial infarctions. It is perhaps in the realm of psychiatric disorder that the most care is warranted in handling this issue.

## Content Validity

Investigators using the life events approach have differences of opinion about the nature of the events to be included in checklists. Though the various instruments in use have overlapping items, they vary in length, content, relative number of positive and negative items, and number of items over which respondents have no control (such as "death of a friend," in contrast to "marriage"). Most checklists selectively emphasize events of young adulthood, undesirable events, and subjectively evaluated events; this may make it difficult to interpret findings when various groups are being compared. Holmes and Masuda (*13*), Dekker and Webb (*22*), and Uhlenhuth *et al.* (*23*) found, for example, that young adults aged 20 to 30 reported twice as many life changes as those over 60, and throughout the age range a significant inverse relationship prevails. It is unclear, however, whether this finding is due to the character of the scale or to greater degrees of stress in early adulthood. The former possibility is supported by data from the Midtown Manhattan Community Survey of 1660 adults which showed that stresses accumulated with advancing age (*24*).

The "common" events represented on life events checklists may be largely irrelevant to certain groups, or else those groups experience far fewer changes than are usually reported. For example, findings of very few life changes were reported by Wershow and Reinhart (*16*) in their study of 88 chronically ill, marginally employed men who were consecutively admitted for medical reasons to a southern Veterans Administration hospital. In this study, the mean LCU score for the year preceding hospitalization was very low, and 19 percent of the sample reported absolutely no life events at all, apart from Christmas. Before concluding that this population indeed experienced few ordinary life changes, it is necessary to verify the appropriateness and relevance of the checklist items for these particular respondents. This question can be extended to consider the appropriateness of various life event items for members of different socioeconomic and ethnic groups.

In attempting to evaluate the adequacy of item selection, Dohrenwend (*25*) asked samples of community residents, community leaders, psychiatric patients, and convicts to respond to an open-ended question regarding "the last major event in your life that . . . changed your usual activities" and then to the standard checklists of life events for the preceding year. He found that surprisingly few of the events reported in the checklist were previously described by respondents as events they considered major. Further, his different samples cited different kinds of events. He concluded that there really are several domains of life events, and those to be sampled must depend on the goals of a given study.

Considering the same issue, Kellam (*26*) regards the present checklists as too simple and conceptually deficient. He suggests the stratification of life events with items representing the following categories: age group, stage of life, locus of control (fate or personal responsibility), positive versus negative events, and level of social organization involved (such as family, neighborhood, community).

Considerable attention has been devoted to the question of whether an event must be unfavorable to evoke stress. In their original work, Holmes and Rahe scaled life events in terms of "the intensity and length of time necessary to accommodate to a life event, regardless of its desirability"; B. S. Dohrenwend (*27*) also endorses this position, which is supported by extensive clinical work on normal life events such as engagement and marriage (*28*). Gersten *et al.* (*15*), however, disagree; they regard undesirability rather than simply total amount of change as the better definition of stressor. On the basis of community survey data about nearly 700 children, they have concluded that the number of undesirable life events or a balanced scale (sum of undesirable events minus sum of desirable events) is a better predictor of behavioral impairment than is the total number of changes.

Another unresolved issue concerns

the scoring of life event checklists. Some investigators assume that there is only one population of events and so measure stress additively by counting number of events that have occurred in a specified time interval. Others believe that subcategories and weights are preferable. The most common method, noted earlier, is to apply weights derived from judge samples that showed strong convergence of opinions regarding appropriate weighting for particular items. More recently some investigators have asked subjects to rate events in terms of the subjective distress these caused and to indicate the number of times each occurred within the period under study. These subjective ratings were then used as weights in arriving at a total score. Rubin *et al.* (*8*) found that weights derived by stepwise multiple regression analysis of questionnaires provided by naval personnel enhanced the correlations between total scores of the life events measure and counts of subsequent illness episodes of their naval respondents. Finally, the factorial structures of the most commonly used checklists have not been adequately explored; it would be useful to determine empirically how many dimensions are included in their scope and whether separate factor scores may be more useful than the single total score currently employed.

### Confounding Variables

Another issue in life events research that warrants further attention is the possibility of interaction between life changes and other factors, such as availability of social support systems to serve as protective buffers for the affected individual. As defined by Caplan (*29*), social support systems consist of enduring interpersonal ties to a group of people who can be relied upon to provide emotional sustenance, assistance, and resources in times of need, who provide feedback, and who share standards and values. Ideally, one belongs to several supportive groups situated at home, at work, in church, and in a series of recreational or avocational sites. Cassel (*30*) has observed that deficiencies in support systems will not in themselves contribute to susceptibility to illness in the absence of social stressors. The converse is also probable: social stressors in the presence of strong social support systems will have only minor effects on health. An excellent illustration of the value of measuring the interaction of these sets of variables is provided by Nuckolls *et al.* (*31*), who studied life changes and social supports for women during pregnancy, in relation to complications of later pregnancy and delivery. Neither the life-change score alone nor the social support score alone was related to complications. When the two scores were considered jointly, however, significant findings emerged: 90 percent of the women with high life change scores but low social support scores had one or more complications, whereas only 33 percent of women with equally high life change scores but with high social support scores had any complications. The social support scores were irrelevant in the absence of high life change scores. These results clearly document the need for more analytical approaches.

Questions have been raised about the composition of samples in many life events studies. Wershow and Reinhart (*16*) refer to the common failure to "disaggregate groups," as in the study where patients attending a dermatology clinic and those with coronary heart disease are together classified as suffering from chronic disorders, or where protocols of respondents with vastly different backgrounds and life styles are combined for analysis. In the earlier naval studies of Holmes and Rahe, for example, the only distinction made between respondents was based on the ship to which they were assigned. Draftees, career military men, officers and enlisted men, newcomers and old-timers, and those with hazardous and not hazardous jobs were all grouped together. (In recent publications some of these distinctions have been taken into consideration.)

Another design issue concerns the advisability of controlling the variables of socioeconomic status and ethnicity in sample selection and data analysis. Preliminary work by Holmes and Rahe (*4*) suggests that respondents grouped by social class or color rank life events similarly in terms of their perceived impact or magnitude. More direct evidence has been compiled by Dohrenwend and Dohrenwend (*32*), who addressed the issue of a possible relationship between class, ethnicity, and differential experience of life events. After reviewing a wide variety of published studies on class and ethnic differences, they concluded that both class and ethnicity influence exposure to stressful events. They found that lower-class members experience more severe though not more frequent stressful events than do middle-class members. Within social class, stressful situations are both more frequent and more severe for blacks than for whites. Thus far such relationships have been only tentatively explored.

It must be noted that the extensive critical appraisals of life events studies are possible primarily because of the relatively large and coherent body of research that has been published. The fact that different groups of investigators have produced coordinated and cumulative research programs over many years provides critics with an adequate picture of how far work has progressed, what are current deficiencies and weaknesses, and what remains to be done. The field of life events research, like that of psychotherapy research, seems to evoke almost as much critical commentary as empirical data. In life events research, however, communication channels are evidently effective. The quality of recent work surpasses that of earlier studies, and many suggestions have been incorporated into research programs. Increasing numbers of studies are prospective in design, and the researchers concern themselves with sample selection, seek appropriate and relevant items in their checklists, try to refine their outcome criteria, and use multivariate statistical methods in data analyses. With these improvements in design and methods, investigators may be able to demonstrate more accurately the nature of the relationship between life events and subsequent illness episodes than has been done to date.

We would conclude that the life events approach to the measurement of stress and subsequent illness offers a method that is attractive in its simplicity, directness, ease of data collection, and common sense appeal or "face validity." Much work remains to be done in a psychometric sense as well as conceptually, to improve the reliability and validity of the measuring instruments, to develop stratified domains of life events, and to select for investigation only those events that are relevant to the topic and population being studied. It might be profitable to study conditions under which the probability of illness is enhanced by the occurrence of prior life changes in contrast to those where such changes have little impact. Comparison of groups who handle life changes effectively with those who appear to break down with little apparent provocation may also further our understanding of the possible role of life changes in precipitating illness. Another helpful approach might be the extension of the dependent variables examined after the occurrence of life changes.

In short, instead of trying repeatedly to answer the question whether life events play a precipitating role in illness, the next step in the progressive devel-

opment of this field entails examination of the circumstances under which such effects occur and do not occur.

### Mediating Factors

Some people develop chronic diseases and psychiatric disorders after exposure to stressful conditions, and others do not. Indeed, most people do not become disabled even when terrible things happen to them, as Hudgens (*19*) has observed. Exposure to stressors alone is almost never a sufficient explanation for the onset of illness in ordinary human experience, and other factors that influence their impact require consideration. These may be grouped in three broad categories: characteristics of the stressful situation, individual biological and psychological attributes, and characteristics of the social support systems available to the individual that serve as buffers.

Before turning to a review of these mediating factors, it is important to emphasize both their cumulative impact and the reciprocal relationship between them. That is, the more rigorous and severe the external situation, the less significant are social and individual characteristics in determining the likelihood and nature of response. When conditions are sufficiently harsh, as in some wartime situations, prolonged sensory deprivation, or concentration camps, breakdown is virtually universal and individual variations are reflected only in the length of time before the reaction occurs and perhaps in subsequent recovery time. When the stressful situation is less severe, social supports and individual characteristics contribute to an understanding of why some people become ill and others do not. Finally, although it seems probable that extreme environmental conditions can induce disability even in those who do not have social or personal deficits, vulnerability alone, in the absence of stressful conditions, does not precipitate chronic disease or psychiatric disorder.

### Stressor Characteristics

Formal characteristics of stressful events that have been found to influence illness onset include their magnitude (departure from baseline conditions), intensity (rate of change), duration, unpredictability, and novelty. The most widely studied of these is magnitude, which has been investigated among survivors of extreme experiences such as internment in concentration camps or as prisoners of war. A linear correspondence has been observed repeatedly between magnitude of the stressor and extent of both psychiatric and physical disability (*33, 34*). It is now widely agreed that stressors of sufficient intensity and duration will induce an acute stress reaction in all so exposed, regardless of predisposition. There has been less consensus concerning long-term or permanent disabilities, but recent longitudinal data from concentration camp survivors have shown that profound and protracted stressful conditions may have irreversible effects on all (*35*).

Speed of change, prolonged exposure, lack of preparedness, and lack of prior experience have each been found to heighten the impact of stressful events (*36, 37*). Cumulatively these findings suggest that the formal properties of stressors constitute a significant source of variation affecting their influence on individuals.

### Individual Characteristics as Mediating Factors

A critical factor in evaluating the impact of stressful events is the individual's perception of them. Such perception depends on personal characteristics determining the appraisal of the significance of potentially harmful, challenging, or threatening events. It is this cognitive process which differentiates a stressor from a stimulus and which determines the nature of the stress reaction and subsequent coping activities (*38*).

The perception of stressful events is mediated by two broad categories of variables, one consisting of personal or "internal" factors and the other of interpersonal or external ones, following the Dohrenwends' (*32*) conceptualization. Personal factors include, for example, biological and psychological threshold sensitivities, intelligence, verbal skills, morale, personality type, psychological defenses, past experience, and a sense of mastery over one's fate (*7, 32, 34*). Demographic characteristics such as age, education, income, and occupation may also contribute to the individual's evaluation of stressful conditions and his response to them (*23*).

The effects of most personal variables in mediating stressful conditions are fairly obvious: persons with more skills, assets, and resources and with more versatile defenses and broader experience tend to fare better. In general, the more competence individuals have demonstrated in the past, the more likely it is that they will cope adaptively with a current stressor. The more experience they have had previously with a particular stressor, the more probable that their present responses will be effective (*37*).

The correspondence of personality type to stress reactions and to vulnerability to disease is less clear-cut. As noted in the introductory section, the subject has been of major interest among those concerned with the psychosomatic approach. Over the years, investigators have proposed several models to account for the impact of intrapsychic factors on bodily function, such as Adler's concept of organ inferiority (*39*), Alexander's idea that specific emotional conflicts are determinants of disordered function in a particular organ (*40*), and Dunbar's that personality constellations are associated with specific psychosomatic disorders (*41*). With the passage of time and accumulation of experience, these approaches to the understanding of personality and illness have become less popular. Investigators who have continued to work within this tradition have turned their attention to the delineation of broad life styles and behavior patterns rather than specific intrapsychic constellations and conflicts. A major focus within this framework has been on personal correlates of premature coronary heart disease, myocardial infarction, and sudden death. Studies of the behavior of individuals prone to coronary disease have identified distinctive behavioral and characterological styles which may serve as predisposing factors (*42*). The extensive research on clustering of life events in association with myocardial infarction and sudden cardiac death does not contradict these findings, since such life events apparently serve as triggering or precipitating elements influencing the timing rather than the risk of illness onset.

### External Mediating Variables

Another broad set of contingencies, or mediating variables, in the stress equation which may be considered social or transactional in nature consists of the buffers and supports accessible to the individual in his social environment. The social positions individuals or groups occupy in a community can materially influence their experience of stress and presumably, therefore, their vulnerability to a broad range of chronic diseases. While the effects of exposure to stressful

events may be reduced for those who are effectively embedded in social networks or support systems (*29, 43*), they are commonly exacerbated by deficiencies or impairments of such systems. Three such categories—social isolation, social marginality (minority membership), and status inconsistency—may be considered in this context.

Urban sociologists recognized years ago that deteriorating areas of the central city had disproportionately high rates of disorders, both medical and psychiatric (*44*). More recently, social isolation has been delineated as a major factor in increased risk of disease. There is now considerable evidence to suggest that those who live alone and are not involved with people or organizations have for this very reason a heightened vulnerability to a variety of chronic diseases (*45–47*). A generalized "failure to thrive" among institutionalized children is often associated with a lack of meaningful relationships to other people (*48*). Also in this context, it has been observed that bereavements are a potential source of ill health, apparently in relation to the social isolation created by the loss of a spouse (*49*).

While social isolation is perhaps the most extreme example of impairment of one's position in the community, marginal social status due to membership in a low-status group or simply in one that constitutes a numerical minority in the area has also been associated with increased health risks (*47*). Sheer numerical size of a given group, sometimes referred to as ethnic density, has been found to be inversely related to psychiatric hospitalization rates: as a given ethnic group constitutes a smaller proportion of the total population in a particular area, diagnosed rates of mental illness increase in comparison both to the rates for other ethnic groups in that area and to the rates of the same ethnic group in neighborhoods where its members constitute a significant proportion or majority. This observation has been made with respect to Chinese in Canada (*50*), French and English minorities in neighboring Quebec towns (*51*), Italians in different Boston areas (*52*), and black and white residents of various census tracts in Baltimore (*53*). Presumably the smaller the community of ethnically similar members, the less the social support available to any one member. Equivalent findings have been noted for socially marginal groups with respect to such diseases as tuberculosis (*45*).

The third social variable, status inconsistency, refers to the situation where an individual occupies two or more distinct social statuses or roles that involve incompatible social expectations. For example, mother–married–adult are three compatible statuses, in contrast to mother–unmarried–adolescent. Other forms of inconsistency may entail lack of fit between education and occupation, or between age or sex and employment. Studies exploring the stressful effects of status incongruence have been conducted both with individuals in survey format and with populations for which aggregate data are derived from public records (*2*).

Studies of individuals have dealt with observed discrepancies between education and income level, or education and occupational rank, which were presumed to generate role conflict. While a few investigators have failed to find an association between status incongruence and measures of health (*54*), several have found it, using different kinds of samples and measures of health (*55*).

Hinkle and his colleagues at the Human Ecology Study Program at Cornell (*56*) analyzed the medical histories of 2600 semiskilled workers who worked for the New York City telephone company continuously for 20 years. Admittedly, this is an atypical group in terms of geographical and employment stability and consequent lack of exposure to social change. The investigators found an enormous range in the number of illness episodes recorded, from fewer than 5 days a year of absence due to illness to an average of 50 days a year for 20 years. The very healthy workers were found to be people whose social backgrounds, aspirations, and interests coincided with their present circumstances, whose family, educational, and occupational statuses were consistent. This was not the case for the frequently ill workers, whose educational or family status was often inappropriately high for the kind of work they were doing. Hinkle did not invoke the concept of status inconsistency in his conceptual analysis, but his findings lend themselves to an understanding in this context.

The literature concerning variables that mediate the impact of stressful events on individuals derives from so many sources that a general critical appraisal would be unsuitable. Some of it represents conventional, well-executed laboratory studies with clearly defined independent and dependent variables. Other studies, such as those of concentration camp survivors, are necessarily retrospective in design, based on samples of convenience and ad hoc measures of change. However, most of the findings so briefly summarized here have been reported by several investigators working independently, with different populations. The results are therefore cumulatively persuasive, and open a variety of areas for future exploration.

## Summary

Athough conceptual and theoretical orientations should play an important preparatory role in the design and execution of empirical studies, this does not often appear to be the case in the literature reviewed on the relation of life events, stress, and illness. It is clearly recognized that illness onset is the outcome of multiple characteristics of the individual interacting with a number of interdependent factors in the individual's social context in the presence of a disease agent. The conceptual model is comprehensive, multicausal, and interactive; empirical designs should consider this complexity. In spite of the repeatedly observed trivial relationships between measures of change in life events and illness onset (or care-seeking behavior), many investigators continue to focus on linear relationships between independent and dependent variables without consideration or control of intervening and mediating variables, some of which easily lend themselves to standard measurement procedures. To advance the accurate prediction and understanding of illness onset, the design and execution of empirical studies must take into account, as Mechanic and others have stressed, the complexity of the phenomena being studied.

Crucial in the measurement process are the psychometric properties of the measures used and the methods of collecting data that are employed. Investigators in the area of life events research are vulnerable in their operational definitions of both independent and dependent variables.

More emphasis should be placed on a thorough conceptualization and sampling of the universe of life events, followed by multidimensional scaling of item samples in a variety of respondent samples drawn from theoretically meaningful populations to identify common dimensions of life events. The internal consistency and test-retest reliability of summary scales derived from those analyses should be studied across samples to determine the true variance and stability of these measures over a variety of populations.

The use of unidimensional scales with questionable content validity continues to be a problem in the operational definition of such complex domains as reported symptoms of illness or mental illness. The continued use of one measure to represent an obviously complex domain of symptoms will frequently lead to limited and erroneous conclusions. An extensive literature also indicates that symptoms of mental and physical illness are not unidimensional.

In retrospective studies important sources of error in the measurement of life events include selective memory, denial of certain events, and overreporting to justify a current illness. In prospective studies, the subjective evaluation of the significance of a life event to the respondent has been neglected.

The data analytic procedures used in life events research do not adequately inform the reader of the nature of obtained results. Certain procedures crucial to the understanding of results seldom have been undertaken. For example, not one instance of an estimate of the internal consistency reliability of a life events scale was discovered in this review, though such values are important in the evaluation of measures and in the interpretation of the magnitude of relationships. Further, the application of similar data analytic procedures to the data of a number of studies would enhance the comparability and communication of results and the possibility of making generalizations. It is concluded that improvement in data analytic procedures remains a major challenge for life events investigators.

Refinements of method and content in this field are to be encouraged, in the expectation that they will contribute to a better understanding of the disease process and also to the development of techniques of primary prevention of illness and rehabilitation of the chronically ill.

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