THE IMPACT OF LIFE EVENTS ON PSYCHIATRIC SYMPTOMATOLOGY

By

CHARLES ELMER HOLZER III

A DISSERTATION PRESENTED TO THE GRADUATE COUNCIL OF
THE UNIVERSITY OF FLORIDA IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1977

To

Jean, Robin
and
Christopher Paul

ACKNOWLEDGMENTS

I would like to thank Dr. George J. Warheit, chairman of my doctoral committee, friend and colleague, for his intellectual and emotional support throughout the creation of this dissertation. His guidance has brought focus and closure to an otherwise open ended process. I would also like to thank the remainder of my committee, Dr Gerald Leslie, Dr. Benjamin Gorman, Dr. Anthony LaGreca, and Dr. Alan Agresti for counsel and support throughout this endeavor.

This research is based on data collected under the auspices of National Institute of Mental Health Grant #15900 with John J. Schwab, M.D., as Principal Investigator. This work has been continued while working on NIMH Grant MH 24740 with Dr. George J. Warheit as Principal Investigator. Without the direct and indirect support of these grants, the present research would have been impossible. Sue Legg, in particular, deserves mention for her efforts in coordinating the follow-up interviewing, but the staff members of these respective projects have all made material contributions to this effort.

The analyses used in this presentation were performed using the facilities of the Northeast Regional Data Center and the Center for Instructional and Research Computing Activities. Computing funds were provided by the Colleges of Medicine and Arts and Sciences. Most of the computer runs were made by Jean B. Holzer, an effort which facilitated my concentration on the writing process.

During the process of writing this report, and the countless drafts which preceded it, Paul M. Cohen acted as a sounding board for most of the ideas presented and as an editorial consultant. Editorial assistance was also provided by Lynn Robbins, Joye Barnes and Jean Holzer. Throughout this drafting process the person who, more than any other, kept the project alive was Linda Johnston. She cheerfully survived the many waves of text which preceded this last revision. The final typing of the manuscript was performed by Sue Kirkpatrick and Nancy McDavid. They labored well under excessive time pressure and should bear no responsibility for the errors which I have managed to slip past them.

I also want to acknowledge the support of a more general nature, that of concern and enthusiastic encouragement from many friends and colleagues. A few, Drs. John Adams, John Kuldau, Meyer Maskin, Jim Fuson, and Ralph Selfridge, stand out above the rest, but there are many more than can be mentioned.

Finally, there is no one who suffered more through the protracted effort of producing this dissertation than my wife, Jean, and children, Robin Ann and Christopher Paul. They quietly tolerated my absence from normal family life and were still able to provide support when I needed it.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF FIGURES

KEY TO SYMBOLS AND ABBREVIATIONS

β = Regression coefficient

ε = Error term in a regression equation

χ^2= Chi square statistic from test of independence

R^2= Coefficient of determination

r = Pearson correlation coefficient

Abstract of Dissertation Presented to the Graduate Council of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

THE IMPACT OF LIFE EVENTS ON PSYCHIATRIC SYMPTOMATOLOGY

By

Charles Elmer Holzer III

March, 1977

Chairman: Dr. George J. Warheit
Major Department: Sociology

This research analyzes the relationships between life events, socioeconomic status and psychiatric symptomatology. A review of the stress literature identifies a series of three general stress relationships which, when applied to the study of life events, produce three working hypotheses:

Hypothesis 1: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the level of life events.

Hypothesis 2: The strength of the association between level of life events and level of psychiatric symptomatology varies inversely with the level of socioeconomic status.

Hypothesis 3: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the subsequent level of life events.

These hypotheses are tested using a panel design based on an original epidemiological survey (N=1645) conducted in 1970 and a follow-up survey (N=517) conducted in 1973. This design permits examination of change in symptom scores over the three-year period as a result of intervening life events, controlling for socioeconomic status.

The operational definition of psychiatric symptomatology is the Health Opinion Survey (HOS) index, a psychiatric community screening device developed by Macmillan and modified by Leighton. It has been shown to be an adequate measure for distinguishing psychoneurotic patients from community controls. The primary measure of life events, based on the work of Paykel, consists of a list of 61 items which might have occurred during the period between interviews. Paykel had previously developed ratings showing the expected amount of psychological upset typically produced by each event. Scores on the Paykel measure consist of the sum of weights for the events which occurred.

The third major variable is an index of socioeconomic status (SES) based on methodology developed by the U.S. Bureau of the Census. It is an average of the respondent's rankings on education, occupation and income.

Additional life event indices are constructed using categorizations based on entries versus exits, areas of social activity, the dependence of the event on previous symptomatology, and the year of occurrence. An unweighted index of the full set of items, and the separate items are also considered.

The data are analyzed primarily through the use of multiple regression models, with equations for prediction

of 1973 HOS scores both cross-sectionally from 1973 data alone, and as change over time by inclusion of 1970 HOS scores as a control. A separate regression model is used to predict the life event scores from the 1970 HOS scores.

The findings from these analyses are as follows:

(1) Only a small proportion (2.1%) of the change in HOS scores can be attributed to life events.

(2) The association of life event scores with changes in psychiatric symptomatology over a three-year period is inversely proportional to the socioeconomic status of the respondents involved. Life events are more strongly predictive of changes in symptomatology for low SES respondents than for high.

(3) Symptom scores for 1970 are predictive of life events scores for the period following 1970, suggesting a reciprocal relationship between symptoms and events over time.

(4) Symptom levels are highly stable over the three-year period. Symptom levels for 1970 predict more than 60% of the variance in 1973 HOS scores, suggesting that the major factors determining symptomatology are chronic rather than transient phenomena.

(5) Examination of the alternative indices of life events reveals that some are much more predictive of symptomatology than others, the most predictive being exits, events with known or possible symptom dependence, personal health and marital difficulties.

(6) The influence of life events on symptomatology depends partially on the time elapsed between the occurrence of the event and the measurement of the symptoms. Recent events are strong predictors of symptomatology.

Thus the above study has examined the influence of life events on psychiatric symptomatology and has demonstrated the presence of a small but significant influence which is greater in strength for those with lower than with higher socioeconomic status.

CHAPTER 1

INTRODUCTION AND CONCEPTUAL FRAMEWORK

The primary objective of this research is to analyze the relationships between life events, stress, and psychiatric symptomatology. The past decade has witnessed a rapid expansion in the number of studies dealing with this subject. Despite the volume of these investigations, their theoretical and methodological limitations have hampered attempts to clarify the strength and direction of causality between life events and psychiatric symptomatology. As recently as the final drafting of this report, a review article has been severely critical of the current theoretical and methodological state of the field (Rabkin and Struening, 1976).

At the theoretical level, the debate regarding the medical versus social nature of mental illness remains unresolved. One consequence has been that both etiology and definition have been poorly specified (B. P. Dohrenwend, 1975). At the methodological level, cross-sectional and retrospective designs have not adequately controlled for factors predisposing individuals either to the occurrence of life events or to psychiatric symptomatology. Not only have these theoretical and methodological limitations

seriously undermined attempts to specify the strength and direction of causality for the relationship between life events and psychiatric symptomatology, but they have also contributed to the failure to specify the contextual factors which shape it.

Three major issues must be addressed in order to specify clearly the relationship between life events and psychiatric symptomatology. The first of these is the determination of the influence of life events, both general and within specific subcategories, on the subsequent development of psychiatric symptomatology.

The second issue is whether there exists reciprocal causality between life events and psychiatric symptomatology over time. Most studies have assumed that life events act only as causes of psychiatric symptomatology. The longitudinal design adopted here permits us to explore the extent to which life events themselves may be the result of psychiatric symptomatology.

The final issue is the role of intervening factors, such as resource availability, which influence the relationships between life events and psychiatric symptomatology. Most often, socioeconomic statuses are seen as major indicators of resources which an individual can utilize in meeting the demands which life events place on him. Implicitly and explicitly, research in the area assumes that the impact of life events will be greatest for persons in the lower socioeconomic statuses.

The Method of the Study

This research is designed to deal with each of the above issues. A panel design has been adopted. This approach builds on an epidemiological survey originally conducted in 1970; in 1973 approximately one-third of the original respondents were reinterviewed. The 517 respondents interviewed at both times provide a panel which is representative of a broad segment of the community population.

For the purposes of this study, life events have been operationalized in terms of the degree of upset typically produced by an event (cf. Paykel et al., 1971); psychiatric symptomatology has been operationalized as Health Opinion Survey scores (cf. Macmillan, 1957), a measure of psychoneuroticism; and socioeconomic status has been operationalized as an index combining education, occupation, and income (U.S. Bureau of the Census, 1960).

Analysis of change within this panel design provides a means of observing the relationship between life events and change in symptom levels over time. It also makes possible observation of the influence of symptomatology at a particular point in time on the subsequent occurrence of life events. Finally, the introduction of socioeconomic status as a factor interacting with life events in its influence on symptomatology helps to establish the importance of intervening factors in the influence of life events.

Only three prior studies have utilized panel designs to study the impact of life events on psychiatric symptomatology, and each of these has been seriously limited either in the scope of the data on which analysis could be conducted,or in the form of analysis which was applied to the available data.

The present study has advantages over these previous ones in terms of the size of the sample utilized and in the application of multivariate statistical procedures which facilitate a formal modeling of the interactions among the life events, psychiatric symptoms, socioeconomic status, and other control variables.

Plan of the Report

In Chapter 2 a review of several models of stress and adaptation is presented. From this review three general statements relating demand, resources, and maladaptive response are identified; these provide guidelines for this research. In the next section of Chapter 2, drawing from the works of Paykel, life events are identified as sources of demands, and an approach to quantify that demand is presented. Then the definition of resources used in this research is presented. Finally, a measure is identified for psychiatric symptomatology, the central part of social-psychological maladaptive response.

In Chapter 3 the methodology of the present study is described. This description includes the design, sampling procedures, interviewing, index construction, and finally the plan of analysis.

Chapter 4 presents tests of hypotheses, which are based primarily on regression analyses of the change in levels of symptomatology over time. It also examines the dependence of life events on prior levels of symptomatology. The next section of Chapter 4 examines the cross-sectional forms of the hypotheses and thus provides a point of comparison with most other life events studies. The remainder of the chapter consists of reexamination of the hypotheses based on alternate forms of the life event index and thus addresses basic issues in the aggregate measurement of life events.

Chapter 5 provides a summary of the results and offers conclusions regarding the relationships between life events, socioeconomic status, and psychiatric symptomatology. Finally, it discusses implications for future research.

CHAPTER 2

THEORETICAL BACKGROUND AND REVIEW OF LITERATURE

Although the present study focuses on life events and psychiatric symptomatology, the basis of the research is found in stress theory. This chapter begins with a general model of stress and identifies the three general findings of stress research. It then traces efforts at quantification of stress through the development of life event research. After providing means for quantification of the demand produced by life events, measures for socioeconomic status, as resources, and for psychiatric symptomatology as maladaptive response are provided. Finally a set of three working hypotheses relating life events, psychiatric symptomatology, and socioeconomic status is developed from the general statement derived from review of the stress literature.

A Model of Stress

Origin of the Concept

The term stress traces its origins to engineering usage, in which stress refers to a set of forces directed at a physical material with the result that changes take place in the material prior to its collapse. These changes are

called strain. The terms stress and strain have been adopted as a metaphor describing the effects of an adverse environment upon a wide variety of phenomena.

Physiological Approaches to Stress

One of the milestones in stress research was Cannon's (1939) original experimental study of the process of homeostasis, the set of processes by which humans and other living organisms maintain a dynamic balance in the face of adverse environmental situations. This original work was extended and codified by Selye (Selye and Fortier, 1950; Selye, 1955, 1956, 1974) into the model of stress which has been the point of departure for much of present stress research. From experimental studies Selye discovered that the process of adaptation to environmental disturbances involves two and, sometimes, three phases. The first of these, an alarm reaction, produces a consistent but general pattern of physiological response termed the General Adaptation Syndrome (GAS). The second phase is a progression to more specific local adaptation syndromes in which specific responses are directed at particular environmentally produced disturbances. The third phase is one in which specific responses are exhausted, once again leaving a general response. In the case of an extreme and persistent disturbance, this is maintained until the final collapse of the organism. Essential to Selye's formulation is the

limited capability of the organism to maintain a response without exhaustion or damage to the organism. This damage, and the reaction promoting it, provide Selye's definition of stress. Damage to the organism has been the basis for widespread application of Selye's model to chronic health problems.

The major criticisms of Selye's model for the present purposes are its physiological focus, its failure to recognize that, although the GAS is a patterned response, it may vary among individuals (Appley and Trumbull, 1967), and the confusion produced by Selye's application of the term stress to that which engineers term strain.

The works of Cannon and Selye were preludes to widespread exploration of environmental factors which produce physiological disturbances. Much of this research has remained physiological or focused on physical health, but some has been extended to include social and psychological aspects of stress.

Theories of Social-Psychological Stress

The generalization of the concept of stress into social and psychological areas makes available a wide variety of topics for study. These include social and psychological situations which produce stress, cognitive and other subjective processes involved in the individual's perception of one situation as stressful but not another, psychological

defenses used to control the subjective reaction to a stressor, cognitive processes used to solve problems, the use of social structures as support systems, and finally, social and psychological consequences of stress. Each of these issues has been the object of considerable study, and complete review is not possible. Instead, the focus here is on those aspects of stress theory most directly applicable to the present research.

McGrath: A Metatheory of Stress

McGrath (1970) presents a general paradigm for the formulation of theoretical models of stress. His work is used as a point of departure because it resembles a general systems approach and thus provides a neutral terminology for comparison of other approaches.

McGrath's formulation begins with an organism embedded in an external physical and social environment. This organism is exposed to objective demands which, through evaluative processes, become subjective demands. The responses to subjective demands are based on the availability of resources. These responses have consequences for the organism and for its environment, thus influencing future demands, as well as resources for meeting these demands.

Adaptation takes place over time, with feedback loops reflecting the flow of events. Thus, adaptation, and the stress accompanying it, constitute processes rather than

static conditions. McGrath points out that definitions of stress focusing exclusively upon demand, whether subjective or objective, or definitions focusing exclusively on response to situations, fail to account for the active balance between demands and resources. The balance between demands and resources determines the formation of stress.

McGrath's formulation is eclectic and thus tends to deal with generalities. For example, he fails to point out that demands and resources must balance not only at the aggregate levels but also within the major subsystems which constitute the organism. Although limited, McGrath's model provides two basic tenents of the present research: first, that an excess of demands over the resources will produce stress response, and, second, that response in one adaptation cycle may affect subsequent levels of demands.

Dohrenwend: A Generalization of Selye's Model

B.P. Dohrenwend (1961), B.P. and B.S. Dohrenwend (1969), and B.S. and B.P. Dohrenwend (1970) have extended Selye's formulation into a model of social-psychological stress which is more specific than McGrath's. They identify four elements of stress: the antecedent stressor, conditioning or mediating factors, the general adaptation syndrome, and the ultimate responses of the organism.

Stressors and mediating factors are generally equivalent to demands and resources but receive fuller development.

B.P. and B.S. Dohrenwend (1969) developed an outline of life events which have been identified as stressors. This four-fold typology of stressors distinguishes achievement from security and developmental from nondevelopmental stressors. While this typology encompasses situations which occur in the lives of nearly everyone, these situations are considered by the Dohrenwends particularly in relationship to social class and ethnicity. A second point of elaboration in the Dohrenwend model is the distinction between internal and external mediating factors. Internal mediating factors include "inner drives, desires, and internalized rules or prescriptions" (B.P. Dohrenwend, 1961:296), as well as other personal attributes which facilitate dealing with a stressor. External mediating factors, on the other hand, include general and specific attributes of the individual's environment, such as systems of social and economic support. Thus, stressors and mediating factors correspond to demands and resources.

In the Dohrenwend formulation, stressors altered by the mediating factors produce an "adaptation syndrome, indicating an intervening state of stress in the organism" (B.S. and B.P. Dohrenwend, 1970:114). This, in turn, may lead to adaptive responses, but also may produce maladaptive responses related to the physiological processes observed by Selye. The Dohrenwends state that "the greater the intensity and duration of stress, the greater its severity and the

likelihood of 'derailment' of the mechanisms of adaptation" (B.S. and B.P. Dohrenwend, 1970:115).

B.P. Dohrenwend (1961) also elaborates on the form of the adaptation syndrome and its maladaptive responses. The adaptation syndrome involves affective, conative, and cognititve facets which Dohrenwend illustrates in terms of combat neurosis. Exact specification of maladaptive response, however, is difficult due to the lack of an absolute standard against which it can be measured. These social and psychological aspects of response to stress, as with evaluations of mental health, are relative to a particular social context, and thus Dohrenwend ultimately bases their evaluation on socially determined standards of behavior (cf. B.P. Dohrenwend, 1961:301). Nonetheless, the Dohrenwends' view of maladaptive response is closely related to the occurrence of what would conventionally be termed psychiatric symptomatology, which will be the definition of maladaptive response used throughout this study.

For the purposes of the present research we will adopt the Dohrenwend model with only a few qualifications. These center on the model's failure to emphasize the dynamic nature of adaptation as a process taking place over time and involving interrelated elements both internal and external to the individual. The adaptive process is diagrammed in Figure 1.

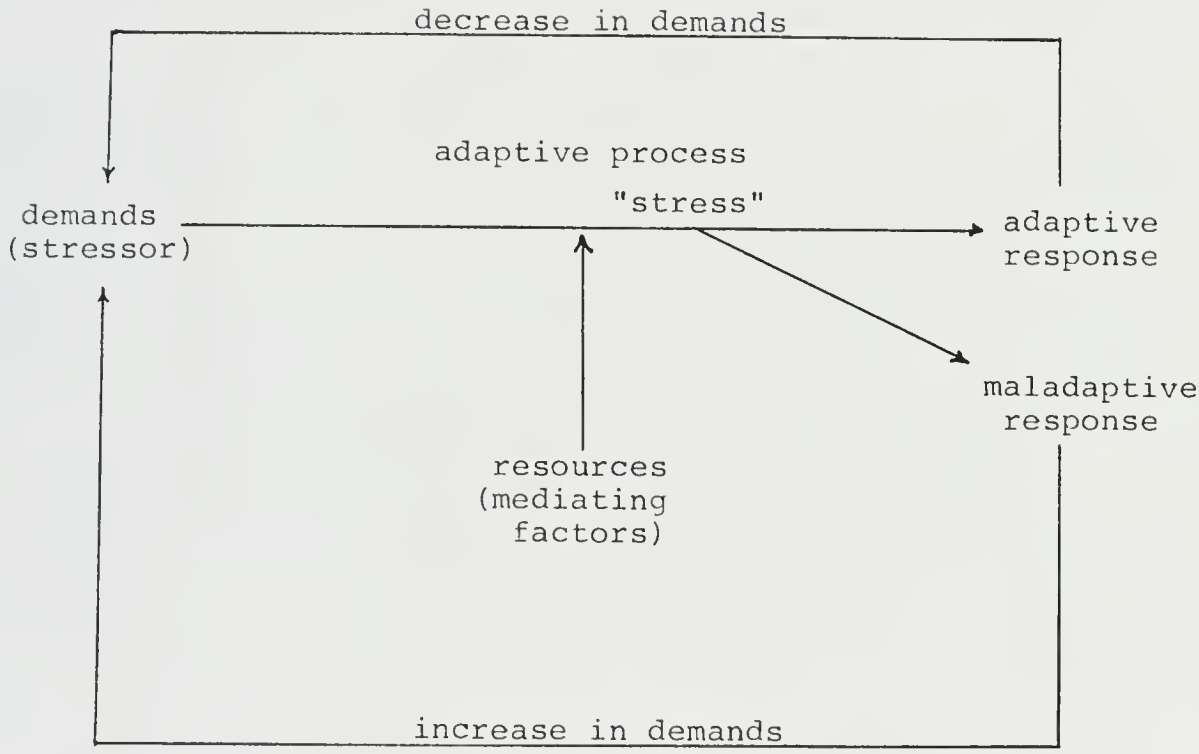


Figure 2.1 Diagram of the Process of Adaptation

Although the above review has emphasized dynamic aspects of the process of adaptation, the present study must approach the practical issue of applying the findings of the review of stress models to the research at hand. Because a single study cannot assess all the different aspects of a stress model, only three basic relationships are identified. These will be used to guide the remainder of the present research.

1. For a specified level of resources, the probability of maladaptive response varies directly with the level of demand.

2. The strength of the association between levels of demand and maladaptive response varies inversely with the level of resources for meeting that demand.

3. For a specified level of resources, the level of maladaptive response varies directly with the subsequent demand.

Each of these statements has been based on the reviewed stress models. Significantly, however, stress, the intervening variable of stress models, is not included as an explicit term. Although stress is a relevant concept, it is omitted because it is not directly observable within the present research context. In a similar fashion, the statements do not specify explicitly whether demand and resources refer to subjective or objective variables. It is believed that objective and subjective appraisals will be highly correlated, on the average, thus making the propositions applicable to either subjective or objective

definition. Because this study makes use of self-report in measuring these concepts, a dimension of subjectivity is introduced, even though objective measurement is attempted.

The Definition and Quantification of Life Events

Efforts to quantify the variables in life event research have their origins in the life chart device of Adolph Meyer and its further development in Harold G. Wolff's laboratory at Cornell (Holmes and Masuda, 1974). Their research identified a series of life events which were usually stressful, evoking psychophysiological reactions and often contributing to the onset of disease. The direct successors to this work have been Hinkle (1974), who has concentrated on longitudinal studies, and Holmes and Rahe (1967), who have concentrated on quantitative methodologies for scaling life events. These, in turn, have propagated a vast quantity of life event studies by other researchers, some of which will be discussed below.

Our immediate concern is the definition of life events as a concept which can guide our theoretical considerations. Unfortunately, however, the term life event has been left ill-defined by virtually all who do life event research. The reason for this difficulty has been the inherently diverse nature of the phenomena which individuals experience as salient enough to identify as an event. This is compounded

by the efforts of researchers and clinicians alike to identify any potentially causative precursor to an observed instance of disease or disability.

In dealing with the diversity of life events, two nonexclusive approaches have been utilized. These are classification and scaling. The former has focused largely on the closely related dimensions of gain versus loss (B. S. Dohrenwend, 1973a), social entrance versus social exit (Paykel and Uhlenhuth, 1972), and desirable versus undesirable (B. S. Dohrenwend, 1973a). Other dimensions have also been explored, such as the amount of control the respondent may have over the occurrence of the event, the confounding of the event with previous mental or physical illness (B. P. Dohrenwend, 1974), or the area of social activity involved (Paykel et al., 1969). These are itemized in Table 2.1.

The efforts at scaling have particularly been associated with Holmes and Rahe (1967) and Paykel et al. (1971), although B. S. Dohrenwend (1973a) has explored a major modification to the Holmes and Rahe measure by incorporating desirability. Because the present research will primarily utilize a scaling approach to life events (e.g., Paykel et al., 1971), we will explore these approaches in greater detail.

Table 2.1. A Summary of Selected Classifications of Life Events Appearing in the Literature

Emphasizes	Dimension of Research Classification	Authors
Factors Controlling the Onset of the Event:	Control vs. No Control	Brown et al., 1973b B. S. Dohrenwend, 1973b
	Confounding of Events with Previous Mental and Physical Health	B. P. Dohrenwend, 1974 Cooper & Sylph, 1973
Characteristics of the Event and Its Impact:	Objective vs. Subjective Occurrence	Thurlow, 1971
	Gain vs. Loss	B. S. Dohrenwend, 1973a
	Desirable vs. Undesirable	Paykel et al., 1969 Myers et al., 1972 B. S. Dohrenwend, 1973a Vinokur & Selzer, 1975
	Area of Activity Involved in the Occurrence	Paykel et al., 1969
	Entrances vs. Exits	Paykel et al., 1975
Interval Measurement:	Social Readjustment	Holmes & Rahe, 1967
	Social Readjustment Adjusted for Desirbility of Event	B. S. Dohrenwend, 1973a
	Amount of Upset expected for the Average Person	Paykel et al., 1971

Social readjustment. Holmes and Rahe (1967) attempted to estimate the magnitude of individual life events by estimating the amount of change from the ongoing life pattern of an individual required by each particular event. They termed this change social readjustment. Holmes and Rahe sought a measure which would make possible the cumulation of change from individual events into a total measure of social readjustment.

Their initial rating of events combined 43 events from previous research into a Social Readjustment Rating Questionnaire (SRRQ) which was administered to a large number of respondents. Instructions included a definition of social readjustment and asked for ratings of the average amount of readjustment for each event relative to an anchor event, marriage, which was assigned an arbitrary score of 500. An event perceived as requiring social adjustment half that of marriage would be scored 250 while an event perceived to require twice the readjustment would score 1,000. In estimating the readjustment required by an event, the raters were asked to consider direct and vicarious experiences. After conducting a number of studies which examined variations among individuals grouped sociodemographically, culturally, and cross-nationally, Holmes and Rahe (1967) claimed

. . . a universal agreement between groups and among individuals about the significance of the life events under study that transcends differences in age, sex, marital

status, education, social class, generation American, religion and race" (p. 217).

On the basis of these findings, Holmes and Rahe (1967) constructed an instrument for studying the impact of life events upon individuals. This instrument, the schedule of recent life events (SRE), has been used in studies examining the relationship between life events and a variety of illness-related phenomena. Many of them are reviewed by Holmes and Masuda (1974) and Rahe (1974).

Although the scale provided by Holmes and Rahe has been used widely and successfully in the prediction of illness and illness behavior, certain limitations of the measure have been recognized. Rahe (1974) reports continuing efforts to improve the measure by changing its format, modifying question content, and experimenting with cluster scoring techniques.

Cochrane and Robertson (1973) provided a broader criticism by noting three difficulties: (1) some items are inappropriate, particularly those dealing with trivial experiences, (2) some important topics are not included, and (3) norms were not available, particularly within patient groups where much life event research was being conducted. Other criticisms noted by Rahe (1974) have focused on the assumptions about ratio scaling, which comprise an essential feature of their approach. Because of these limitations a number of researchers have reapplied

the original approach with modifications in both method and content.

A first alternative to Rahe and Holmes' Social Readjustment is the use of an unweighted index based on the same items. Rahe (1974) has stated that weighting of items may provide no improvement in the prediction of health problems in those situations having uniformly minor events. The weighting becomes more important when some respondents have experienced larger numbers of the extreme events.

A second modification to the social readjustment rating scale was made by B. S. Dohrenwend (1973a). Myers et al. (1971) had previously reported differences in the effect of desirable and undesirable events; therefore, B. S. Dohrenwend developed an index combining desirability and social readjustment. This index was based on the original Rahe and Holmes items, but added the weighted loss events to the total score, and subtracted the weighted gain events from the total score. Thus, gains serve to reduce the total score obtained. This measure has been applied in researches by Dohrenwend and also by Myers et al. (1974).

Paykel: Events As Upsetting. Paykel et al. (1971) constructed a measure of life events based on the degree to which an event is upsetting to the average person. While recognizing the importance of life change in the production of subjective stress, they pointed out that Holmes and Rahe were concerned primarily with somatic

illness. Given Paykel's concern with psychiatric responses, he gave primary consideration to the desirability of events, a dimension intentionally excluded by Holmes and Rahe (1967).

> We chose the concept of upset for several reasons. The most important are concerned with its meaning. We were particularly interested in applying our scale to the precipitation of depression and other psychiatric disturbance, where stress appears closely related to perceived distress. Certainly the recognition of life change as an element represents a distinct advance over the frequent assumption that desirable change entails negligible stress. Nonetheless, in psychiatry questions of desirability, value, and symbolic implication have long been regarded as important in mediating the link between precipitant and reaction. Threats rather than occurrences, and events which involve little actual life change, such as death of parent for an adult with separate home or blows to self-esteem, often appear to precipitate emotional disturbances. Promotion, a desirable change in work responsibilities, although not entirely blame-free, appears less likely to induce disturbances than demotion, its undesirable and ego-threatening equivalent. (Paykel et al., 1971, 345-346)

Thus, although the concept of life change or social readjustment is incorporated into Paykel's formulation, so too are subjective notions of threat and psychological process. The subjective mechanisms causing upset do not, however, enter into either the definition of the resulting state, being upset, nor are they part of the objective event. Consequently, Paykel's conceptualization of subjective mechanisms resulting in upset need not deter empirical study of measurable relationships.

Paykel estimated the degree of upset associated with an event by use of a panel of raters (N=373) who were asked to rate 61 events on a scale from 0to 20 based on how upsetting the event would be to the average person. They were given the following directions:

> Below is a list of events that often happen to people. We would like you to think about each event and decide how upsetting it is. Use your own experience and what you know about other people to make your decision. A particular event might be more upsetting to some people than to others. Try to think how upsetting the event would be to the average person. (Paykel et al., 1971:340)

Analysis of the ratings produced means and standard deviations for each of the items. Comparisons were made across sociodemographic groups and on methodological variables. In all instances the correlations exceeded r = .96. A comparison of the upset ratings with an approximation of social readjustment ratings provided a correlation of r = .484, and a comparable correlation for 14 items having identical wording with the original Holmes and Rahe analysis yielded a correlation of r = .683. Finally, an examination of the standard deviations suggested that, while application of the ratings to individual cases is inappropriate, their use for group comparisons is justified.

Evaluation of Life Event Measures

Assessments of life events made by Holmes and Rahe (1967) and Paykel et al. (1971) relate to stress in different

ways. In both formulations change is an initial demand made upon the individual. Holmes and Rahe ask how much change an event produces while Paykel asks about the upset produced.

As a result, Paykel's approach can readily be interpreted as a measure of net demand, that is, the demand remaining after typical resources have been taken into account. This is consistent with Paykel's definition of the measure as the typical amount of upset resulting for the average person. Adoption of Paykel's approach, therefore, calls for the simultaneous adoption of a general measure of resources; in this research socioeconomic status is used as such a measure. Finally, in supporting Paykel's approach over that of Holmes and Rahe, it must be emphasized that there is a tendency for recurrent situations within society to become socially defined. These social definitions lead to role prescriptions and proscriptions. They further shape societal reactions to the occurrence of the event and to the responses of the individual in adapting to it. Thus, the socially determined demands placed on the individual may go considerably beyond the direct social readjustment experienced by the individual.

A final issue in the quantification of life events is the implication of forming an index of life events based on the scale values obtained from the methods above. The impact of an event may be modified by the occurrence of

multiple events. The ratings obtained above pertain to single events occurring in isolation. But what happens if a second event follows the first? Does the joint effect equal the total of the two ratings or some other combination thereof? Does the greater event govern or does the more recent? These questions have not been fully answered. In the formulation of the present research the effects of events are assumed to be additive. The remaining alternatives must await further research.

Socioeconomic Status As Resources

Prior to development of working hypotheses from the stress propositions, the use of socioeconomic status as a measure of the resources available for meeting the demands posed by life events must be justified. In the three relationships summarized from the review of the stress literature, resources were seen as diverse physiological, psychological, and social elements which relate to specific types and levels of demand. Nonetheless, two empirical factors come together to justify socioeconomic status as an approximate measure of aggregate resources. The first of these is the possibility of conversion or substitution of one resource for another. In physiological systems compensatory adaptations are possible. At the psychological level, coping and defense are such mechanisms of substitution. Finally, social resources, particularly economic

ones, are often convertible to other social resources or to support which augments psychological or physiological capacities.

The second factor is an empirical finding of association between certain attributes and a variety of specific resources. Socioeconomic status, composed of income, education, and occupation, is one such point of convergence. Income, education, and occupation represent resources in a very direct sense, but each is also correlated with a number of other specific resources. These include health, self-confidence, and the availability of friends with resources, among others.

As a point of caution it must be noted that the term socioeconomic status is not equivalent to the standard theoretical terms used to define formal aspects of stratification, for example, prestige or class. As used here, socioeconomic status refers to the general approach for combining education, occupation, and income developed by the U.S. Bureau of the Census (1960).

Psychiatric Symptomatology As Maladaptive Response

The dependent variable for the present research is psychiatric symptomatology and, in particular, that operationalized by the Health Opinion Survey, a symptom index for community screening of psychoneurotic disorders. The rationale for this selection of dependent variable draws

from two sources: Selye's General Adaptation Syndrome (GAS) and B. P. Dohrenwend's model of stress.

Selye (1956) reported that the GAS constituted a stable pattern of physiological response to stress. He based his observations primarily on physiological measurement, but many of the elements of the GAS are also observed in the reports of patients, particularly in those with psychoneurotic anxiety. Similar symptoms are also reported by those with psychoneurotic depressive disorders. Thus, there is a partial concurrence between the GAS and the symptoms of psychoneurotic disorder.

The second argument favoring an examination of psychiatric symptomatology as stress response is found in B. P. Dohrenwend's (1961) formulation of maladaptive response. His qualifier "maladaptive" is not an absolute term but instead rests heavily upon social definitions of acceptable response. In the social and psychological areas, such definitions are strongly related to social definitions of mental illness, particularly those institutionalized within the medical profession. Thus it is appropriate to operationalize maladaptive response in terms of the HOS, a measure which is designed to identify those in a community who would be judged by a psychiatrist to be psychiatric cases.

The Development of Working Hypotheses

Because working definitions have been developed for each of the terms, it is possible to recast the three relationships drawn from the stress literature as working hypotheses relating life events, psychiatric symptomatology, and socioeconomic status. Paykel's formulation of life events provides a specific instance of demand placed on an individual. Dohrenwend's model of stress and Paykel's criterion of upset provide sufficient justification for use of psychiatric symptomatology as the specific social-psychological manifestation of maladaptive response. The final element needed to complete the development of the working hypotheses from the stress proposition is the use of socioeconomic status as a measure of the general level of resources available for meeting the demands imposed by life events.

These working hypotheses are assumed to be testable with an implicit alternative hypothesis for each stating that the relationship was not found to exist. Also implicit is the traditional disclaimer, the assumption that other factors are equal or are appropriately controlled. Finally, the hypotheses are intended to bear interpretation both as variation among individuals and as <u>change within</u> individuals.

The three working hypotheses are:

Hypothesis 1: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the level of life events.

Hypothesis 2: The strength of the association between level of life events and level of psychiatric symptomatology varies inversely with the level of socioeconomic status.

Hypothesis 3: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the subsequent level of life events.

Having developed the theoretical framework and set of hypotheses, the remainder of the study is devoted to providing operational definitions for the terms involved and then testing these hypotheses using both general and specific measures of life events.

CHAPTER 3

METHODS

Research Design, an Overview

The data used in this research were drawn from two community field surveys. The first of these was an epidemiological field survey of health and mental health, and the second consisted of reinterviews with 517 of the original respondents three years after the initial survey. Because the second survey reinterviewed respondents from the original study, it is possible to examine change over time within individuals. This is one of the defining characteristics of panel designs, and a necessity for adequate test of the working hypotheses.

The tests of the hypotheses consist of comparisons of symptom levels at first and second interview with levels of life events occurring between interviews and with socioeconomic status. These comparisons are based primarily on regression models of the effects hypothesized.

The operational variables used in these tests of hypotheses are defined in this chapter. They consist of (1) the Health Opinion Survey, developed originally by Macmillan (1957) and modified by Leighton (1965); (2) an

index of life events based on ratings of psychological upset due to the event (Paykel et al., 1971);(3) an index of socioeconomic status developed by the U.S. Bureau of the Census (1960); and (4) relevant sociodemographic control variables. In the last portion of the analysis, several alternative indices of life events are used to examine the specificity of the hypotheses to the primary index of life events.

Sampling Procedures

Procedures Used in 1970 Sampling

The original survey was conducted in 1970 as a general epidemiological study of physical and mental health in a county in the Southeastern United States. Because of its epidemiologic purpose, it was designed to be maximally representative of the adult, noninstitutionalized population of the community. A systematic two-stage probability procedure was used.

In the first stage, a master sample of 2,315 households was selected out of the total of 30,421. This was accomplished by drawing every thirteenth residential electrical hookup. In some areas of the county it was necessary to supplement this list with addresses drawn through area sampling of county maps. A portion of this list was used to draw a preliminary sample for development of instrumentation. The remainder of the list was used to obtain 1,645 interviews.

The second stage of the procedure, selection of one respondent from each household, was based on a technique reported by Kish (1965). Total non-response was 16.1% with a refusal rate of 8.1%. Non-response also included 1.4% of the total who were unable to complete the interview once begun. These are not included in the refusal rate. The remainder of non-response included not-at-home and invalid addresses.

The Kish technique selects a single individual from a household regardless of size. This may cause a bias by underrepresenting individuals from large households. Kish recommends weighting the responses for individuals from large households so as to reduce the bias. Because of the difficulties of conducting analyses using sample weighting, it has been suggested that such weighting can be eliminated under conditions where relatively few households in the sampling frame have exceedingly large household sizes (i.e., a typical household size), and where independent variables are not strongly related to household size (Kish, 1965:400). Both of these issues were examined. It was determined that relatively few households (17.2%) had more than two adults per household. Likewise, only 19.8% of the households consisted of a lone adult. In these instances, the controls normally provided in reporting obviate the need for weighting because many of the findings are controlled for age and other factors. Additionally, preliminary analyses were

using both weighted and unweighted respondent data. No major differences were discovered between weighted and unweighted results. Finally, the association between major dependent variables and household size was examined and little association detected. Consequently, we followed the procedure suggested by Kish, and reported results in unweighted form. The demographic characteristics of the full 1970 sample are presented in Table 3.1 for comparison with the 1973 sample distributions.

Follow-up Sampling, 1973

A follow-up survey was conducted in 1973 for the purpose of examining change in symptom levels over time. Sampling was based on the 1,645 respondents included in the 1970 survey. Systematic stratified subsampling was used to obtain the follow-up sample. To accomplish this, the 1,645 respondents were ordered on the basis of four variables: race, sex, age (in five categories), and socioeconomic status, i.e., SES (in five categories). This sorted list first presented black males between the ages of 16 and 22 with low SES, followed by increments first in SES, then age, sex, and finally race. Ten stratified subsamples were obtained from this ordered list, through assignment on a rotating basis of the first respondent to the first subsample, the second respondent to the second subsample, etc. The first, eleventh, twenty-first, and thirty-first, etc.,

Table 3.1 Demographic Characteristics of the Original and Follow-up Samples

	Full Sample 1970 Data (N=1645)		Follow-up Sample 1970 Data (N=517)		Follow-up Sample 1973 Data (N=517)	
	Number	Percent	Number	Percent	Number	Percent
SEX						
Male	736	44.7	211	40.8	211	40.8
Female	909	55.3	306	59.2	306	59.2
AGE						
16-22	270	27.1	26	5.0	15	2.9
23-29	315	25.9	68	13.2	45	8.7
30-44	411	25.0	150	29.0	148	28.6
45-59	332	20.2	140	27.1	152	29.4
60 +	315	19.2	133	25.7	157	30.4
RACE						
Black	366	22.3	137	26.5	137	26.5
White	1267	77.0	378	73.1	378	73.1
Other	12	0.7	2	0.4	2	0.4
INCOME						
(total family)	194	15.9	63	15.0	66	14.5
Under $3,000	252	20.7	90	21.4	80	17.5
3,000-5,999	304	23.9	88	20.9	78	17.1
6,000-9,999	250	20.5	87	20.6	88	19.3
15,000 & over	219	18.0	93	22.1	144	31.5
MARTIAL STATUS						
Single	295	17.9	46	8.9	36	7.0
Married	1002	60.9	353	68.3	347	67.1
Widowed	170	10.3	67	13.0	78	15.1
Separated	69	4.2	20	3.9	16	3.1
Divorced	102	6.2	31	6.0	37	7.2
Common Law	7	.4	0	0.0	1	0.2
EDUCATION						
Grade School	304	18.5	117	22.6	125	24.5
Some HS	246	15.0	87	16.8	61	11.9
HS Grad.*	319	19.4	124	24.0	124	24.3
Some College	436	26.6	81	15.7	80	15.7
College Grad.	336	20.5	108	20.9	121	23.7

*Includes trade school graduates.

respondents in the ordered list were assigned to the first subsample. The result was 10 stratified groups with race, sex, age, and SES characteristics as similar to each other and the original sample as possible.

A target size for the follow-up sample was set at 500, based on economics and available manpower. Interviewers were assigned follow-up respondents from the first sublist, and then from successive sublists as earlier ones were exhausted. The interviewers were instructed to locate and interview as many as possible of the respondents within the first group before proceeding to the second. Specific interviewer assignments were made on a rotating basis. As a result, no interviewer was able to select desirable respondents. This required attempts to reinterview substantially more respondents than anticipated. By the time the 517 interviews were obtained, a total of 1,183 interview assignments had been made. Of these, the largest cause for non-interviewing was inability to locate the respondent due to absence from the county (513 or 43.36%). Of those contacted, the refusal rate was 13.4%. Thus, the main reason for non-response was high mobility among the original respondents between 1970 and 1973. Table 3.1 presents the sociodemographic characteristics of the follow-up respondents as they appeared in their original interviews in 1970, and also at the time of follow-up in 1973. Since one of the main reasons for loss

of respondents is the high mobility of university students, faculty, and staff, there were proportionately more blacks, more females, and fewer college age or college educational level respondents in the 1973 sample than in the 1970 sample.

Interviewing Procedures

Most interviewing in the 1970 and 1973 surveys was conducted in respondents' homes, although respondents were occasionally interviewed at their place of work. Interviewers were typically white married females with college-level educations and previous interviewing experience. Interviewers received extensive training in the use of the interview schedule and on methods of contacting and interviewing respondents. Although interviewer turnover was low during the course of each study, only a few interviewers participated in both.

The 1970 interview schedule consisted of 317 items designed to measure interrelationships among social and medical variables. Included in the instrument were (1) demographic data and a comprehensive social history; (2) information on familial and other interpersonal relationships; (3) items regarding life satisfactions, both interpersonal and occupational; (4) indices concerning religion, racial distance, anomie, perceptions of social change and social aspirations; (5) a series of questions concerning attitudes toward, and utilization of, health care services; (6) a

medical systems review and detailed physical symptom data; and (7) a detailed inventory of mental symptomatology including the Health Opinion Survey Instrument (Macmillan, 1957; Leighton et al., 1963; Leighton, 1965), and a series of other scales developed to measure social-psychiatric impairment. Typically, this interview took 90 minutes to complete, although in several instances interviews were either continued at a later time, or were as many as three hours long (N=63). Rarely was a respondent unable to complete the interview.

The 1973 interview retained much of the 1970 schedule in order to preserve comparability. A number of items used in 1970 were eliminated because of their apparent lack of utility in analyses conducted during the interim period. Few changes, however, were made in items being used in the present study. One addition to the 1973 instrument which is of particular import here was the inclusion of the inventory of life events as developed by Paykel et al. (1971). Related to this list of items was a series of probes which tapped respondents' perceptions of each event and its general influence on their mental health.

Construction of Life Event Indices

Measurement of Life Events

As stated in the discussion of life events in the previous chapter, the definitions of the life event indices

are based on those of Paykel et al. (1971, 1972), ratings of the degree of upset produced by events. That discussion further pointed out an intention to assume that multiple life events have additive effects. These decisions form the basis of the main life event index.

Paykel's items are listed in Table 3.2, along with the upset scores obtained for each. Because the interest here is in all events occurring during the period between first and second interview, the total event score is the sum of the weights for those events. This is called the Paykel score.

Note that this particular form of scoring does not account for multiple events of a single type, due to the "yes" versus "no" response solicited for each event. This is not a severe problem, however, because of the low occurrence of multiple events of the same type. Comparisons of analyses using Paykel scores and scores based on multiple occurrences of events, regardless of type, revealed no substantial differences. The correlation between the two forms of index was $r = .93$. Also, the correlation between the Paykel index and an unweighted equivalent, the count of the different types of events, was $r = .96$.

Alternate Indices of Life Events

In addition to the Paykel index, alternative measures of life events have been tested for use in the determination of the specificity of the results of the analyses.

Table 3.2 Paykel's Items; Their Weights and Frequency of Occurrence Within The Follow-up Sample (N=517)

Life Event	Paykel's Upset Rating	Number of Responses	Percentage Experiencing the Event
1 Death of child	19.33	485	2.3
2 Death of spouse	18.76	484	2.9
3 Jail sentence	17.60	516	1.0
4 Death of family member	17.21	517	43.5
5 Extramarital affair (partner)	16.78	428	2.8
6 Major financial difficulties	16.57	517	9.5
7 Business failure	16.46	481	1.0
8 Fired	16.45	483	1.9
9 Miscarriage or stillbirth	16.34	368	1.9
10 Divorce	16.18	459	3.3
11 Marital separation	15.93	450	3.6
12 Court appearance	15.79	516	10.9
13 Unwanted pregnancy	15.57	372	1.6
14 Major illness of family member	15.30	516	29.5
15 Unemployed for one month	15.26	467	11.3
16 Death of close friend	15.18	517	26.5
17 Demotion	15.05	468	.6
18 Major personal illness	14.61	516	15.7
19 Begin extramarital affair	14.09	458	1.7
20 Loss of personal object	14.07	516	9.1
21 Law suit	13.78	517	2.1
22 Academic failure	13.52	469	1.1
23 Child married (not approved)	13.24	421	2.1
24 Break engagement	13.23	373	1.1
25 Increased arguments with spouse	13.02	431	8.4
26 Increased arguments with family member	12.83	504	5.2
27 Increased arguments with fiance	12.66	307	1.0
28 Take a loan	12.64	515	31.3
29 Son drafted	12.32	400	2.0

Table 3.2 (continued)

Life Event	Paykel's Upset Rating	Number of Responses	Percentage Experiencing the Event
30 Troubles with boss or co-worker	12.21	454	6.8
31 Argument with non-resident family member	12.11	517	3.9
32 Move to another country	11.37	498	.6
33 Menopause	11.02	390	8.5
34 Moderate financial difficulties	10.96	516	15.7
35 Separation from significant person	10.68	517	10.1
36 Take important exam	10.44	481	7.5
37 Marital separation not due to argument	10.33	443	6.3
38 Change in work hours	9.96	473	14.4
39 New person in household	9.71	512	13.9
40 Retirement	9.33	472	4.7
41 Change in work conditions	9.23	481	10.8
42 Change in line of work	8.84	478	10.9
43 Cease steady dating	8.80	345	2.3
44 Move to another city	8.52	488	4.5
45 Change in schools	8.15	415	1.4
46 Cease education	7.65	424	5.0
47 Child leaves home	7.20	456	16.7
48 Marital reconciliation	6.95	437	3.4
49 Minor legal violation	6.05	515	8.7
50 Birth of live child	5.91	412	7.3
51 Wife becomes pregnant	5.67	272	7.0
52 Marriage	5.61	455	4.4
53 Promotion	5.39	467	14.8
54 Minor personal illness	5.20	517	23.4
55 Move in same city	5.14	505	15.8
56 Birth of child or adoption (father)	5.13	288	7.3
57 Begin education	5.09	472	7.0
58 Child becomes engaged	4.53	423	9.9
59 Become engaged	3.70	390	3.8
60 Wanted pregnancy	3.56	375	4.3
61 Child married (approved)	2.94	422	14.9

A major thrust in life event research has been analysis of events by type rather than by means of a single index. The variety of classifications used with life events was identified in Chapter 2.

Although specific hypotheses were not stated for these classifications, specification of results along these dimensions is nonetheless considered to be important. The following measures of life events have been developed for use in later comparisons.

Exits and Entrances in the Social Field

Paykel et al. (1971) distinguish between exits and entrances in the social field. The classification of life events into exits and entrances is presented in Table 3.3. The exit category includes those events which relate to the loss of a social object or opportunity to perform one or more roles. The entrance category includes events which increase the respondent's role performances in the social field. It is worth noting that Paykel reports more events in the exit than in the entrance category, and that exits--with few exceptions--have substantially higher scores on the upset scale. These measures will be termed Paykel entrances and Paykel exits respectively.

Independence and Symptom Relatedness of Life Events

B.P. Dohrenwend (1974) has suggested that life events be

Table 3.3 Classification of Events as Entrances to and Exits from the Social Field

Exits from the Social Field

Item Description	Weight	Pct.
Death of child	19.33	2.3
Death of spouse	18.76	2.9
Death of family member	17.21	43.5
Divorce	16.18	3.3
Marital separation	15.93	3.6
Death of close friend	15.18	26.5
Child married (not approved)	13.24	2.1
Break engagement	13.23	1.1
Separation from significant person	10.68	10.1
Marital separation not due to argument	10.33	6.3
Cease steady dating	8.80	2.3
Child leaves home	7.20	16.7
Child married (approved)	2.94	14.9

Entrances into the Social Field

Item Description	Weight	Pct.
New person in household	9.71	13.9
Marital reconciliation	6.95	3.4
Birth of live child	5.91	7.3
Marriage	5.61	4.4
Birth of child or adoption (father)	5.13	7.3
Become engaged	3.70	3.8

distinguished in terms of the likelihood that they may be confounded with psychological or physical disturbances. Paykel et al. (1975) recognized a similar issue in distinguishing controlled from noncontrolled events. In accordance with these concerns, events were classified in terms of the probability that they might be precipitated by prior symptomatology.

The submeasures consist of weighted summations of events within three categories. The first category consists of events whose occurrence or scheduling is beyond the influence of the respondent. Table 3.4 lists these events. They are linked either to the life cycle (menopause, birth, or death of others) or are externally scheduled or determined (take an important exam, marital separation not due to an argument). These scores of symptom-independent life events will hereinafter be referred to as Paykel-independent scores.

The second submeasure consists of events most likely to have been precipitated by prior symptomatology. These scores include items describing changes in interpersonal relationships at home and at work. They also include items related to changes in occupational or legal status having a high potential for precipitation by symptom-related changes in role performance. The items included are listed in Table 3.4. This submeasure of symptom-dependent life events will hereinafter be referred to as Paykel-dependent scores.

Table 3.4 Classification of Events According to Judgments of Their Dependence on Prior Symptomatology

Paykel Events Probably Independent of Prior Symptomatology

Item Description	Weight	Pct.
Death of child	19.33	2.3
Death of spouse	18.76	2.9
Death of family member	17.21	43.5
Miscarriage or stillbirth	16.34	1.9
Unwanted pregnancy	15.57	1.6
Major illness of family member	15.30	29.5
Death of close friend	15.18	26.5
Son drafted	12.32	2.0
Menopause	11.02	8.5
Take important exam	10.44	7.5
Marital separation not due to argument	10.33	6.3
New person in household	9.71	13.9
Birth of live child	5.91	7.3

Paykel Events Probably Related to Prior Symptomatology

Item Description	Weight	Pct.
Jail sentence	17.60	1.0
Extramarital affair (partner)	16.78	2.8
Fired	16.45	1.9
Divorce	16.18	3.3
Marital separation	15.93	3.6
Court appearance	15.79	10.9
Demotion	15.05	.6
Begin extramarital affair	14.09	1.7
Law suit	13.78	2.1
Academic failure	13.52	1.1
Break engagement	13.23	1.1
Increased arguments with spouse	13.02	8.4
Increased arguments with family member	12.83	5.2
Increased arguments with fiance	12.66	1.0
Troubles with boss or co-worker	12.21	6.8
Argument with non-resident family member	12.11	3.9
Cease steady dating	8.80	2.3
Minor legal violation	6.05	8.7
Minor personal illness	5.20	23.4

Table 3.4 (continued)

Paykel Events with Unknown Relationship to Prior Symptomatology

Item Description	Weight	Pct.
Major financial difficulties	16.57	9.5
Business failure	16.46	1.0
Unemployed for one month	15.26	11.3
Major personal illness	14.61	15.7
Loss of personal object	14.07	9.1
Child married (not approved)	13.24	2.1
Take a loan	12.64	31.3
Move to another country	11.37	.6
Moderate financial difficulties	10.96	15.7
Separation from significant person	10.68	10.1
Change in work hours	9.96	14.4
Retirement	9.33	4.7
Change in work conditions	9.23	10.8
Change in line of work	8.84	10.9
Move to another city	8.52	4.5
Change in schools	8.15	1.4
Cease education	7.65	5.0
Child leaves home	7.20	16.7
Marital reconciliation	6.95	3.4
Wife becomes pregnant	5.67	7.0
Marriage	5.61	4.4
Promotion	5.39	14.8
Move in same city	5.14	15.8
Birth of child or adoption (father)	5.13	7.3
Begin education	5.09	7.0
Child becomes engaged	4.53	9.9
Become engaged	3.70	3.8
Wanted pregnancy	3.56	4.3
Child married (approved)	2.94	14.9

The third submeasure is based on a residual category of events: those not included in the symptom-independent or symptom-dependent measures. The events falling into this residual category are also listed in Table 3.4 and appear to have somewhat less probability of having been precipitated by prior symptomatology. These submeasures will be referred to as Paykel-unknown scores.

It must be emphasized that the operational categorization of events used in creating these submeasures is based on judgments of the author and a colleague. As such, they merely estimate the probability of symptom dependence. However, this method was necessitated by the difficulties in obtaining actual statistical estimates of symptom dependence. This level of accuracy should be adequate for illustrating the symptom dependence of various classes of life events.

Area of Activity

The fourth categorization is based on the Paykel et al. (1975) designation of areas of activity or roles affected by the event. The five categories provided by Paykel are work, health, family, marital, and legal. Because Paykel's initial categorization was based on a sublist of only 32 events, it was necessary to modify the categories to include all 61 items in the inventory. The categories used here are education, work, legal and financial, personal health,

family, marital, and social, and will be named accordingly. The family category excludes events involving only the spouse, and the social category is largely residual. The listing of these items by category is presented in Table 3.5.

Events by Year of Occurrence

The last set of life event measures stratifies the year of event occurrence rather than the type of event occurring. This set is designed to test the importance of how recently an event occurred on the level of impact it may have on symptomatology. Making use of the respondents' dating of events, events were classified into approximate one-year intervals. The periods are approximate due to faulty recall by respondents and the unavailability of interview date within the working files. This imprecision does not, however, cause difficulty due to the one-year intervals used. The measures are termed Paykel-1971, Paykel-1972, and Paykel-1973, based on the year in which the time interval ended.

Measurement of Psychiatric Symptomatology

In the previous chapter psychiatric symptomatology has been identified as one part of a syndrome of maladaptive response to stress. The index of psychiatric symptomatology used here, the Health Opinion Survey, or Macmillan Index, was developed as a psychiatric screening device for use in the community. As a screening device, it was intended to be

Table 3.5 Classification of Events by Area of Social Activity

Work Related

Item Description	Weight	Pct.
Fired	16.45	1.9
Unemployed for one month	15.26	11.3
Demotion	15.05	.6
Troubles with boss or co-worker	12.21	6.8
Change in work hours	9.96	14.4
Retirement	9.33	4.7
Change in work conditions	9.23	10.8
Change in line of work	8.84	10.9
Promotion	5.39	14.8

Legal and Financial

Item Description	Weight	Pct.
Jail sentence	17.60	1.0
Major financial difficulties	16.57	9.5
Business failure	16.46	1.0
Court appearance	15.79	10.9
Law suit	13.78	2.1
Take a loan	12.64	31.3
Moderate financial difficulties	10.96	15.7
Minor legal violation	6.05	8.7

Education

Item Description	Weight	Pct.
Academic failure	13.52	1.1
Take important exam	10.44	7.5
Change in schools	8.15	1.4
Cease education	7.65	5.0
Begin education	5.09	7.0

Personal Health

Item Description	Weight	Pct.
Miscarriage or stillbirth	16.34	1.9
Unwanted pregnancy	15.57	1.6
Major personal illness	14.61	15.7
Loss of personal object	14.07	9.1
Menopause	11.02	8.5
Birth of live child	5.91	7.3
Minor personal illness	5.20	23.4
Wanted pregnancy	3.56	4.3

Table 3.5 (continued)

Family and Parenting

Item Description	Weight	Pct.
Death of child	19.33	2.3
Death of family member	17.21	43.5
Major illness of family member	15.30	29.5
Child married (not approved)	13.24	2.1
Increased arguments with family member	12.83	5.2
Son drafted	12.32	2.0
Child leaves home	7.20	16.7
Birth of child or adoption (father)	5.13	7.3
Child becomes engaged	4.53	9.9
Child married (approved)	2.94	14.9

Marriage and Dating

Item Description	Weight	Pct.
Death of spouse	18.76	2.9
Extramarital affair (partner)	16.78	2.8
Divorce	16.18	3.3
Marital separation	15.93	3.6
Begin extramarital affair	14.09	1.7
Break engagement	13.23	1.1
Increased arguments with spouse	13.02	8.4
Marital separation not due to argument	10.33	6.3
Marital reconciliation	6.95	3.4
Wife becomes pregnant	5.67	7.0
Marriage	5.61	4.4
Become engaged	3.70	3.8

Other Social Events

Item Description	Weight	Pct.
Death of close friend	15.18	26.5
Increased arguments with fiance	12.66	1.0
Argument with non-resident family member	12.11	3.9
Move to another country	11.37	.6
Separation from significant person	10.68	10.1
New person in household	9.71	13.9
Cease steady dating	8.80	2.3
Move to another city	8.52	4.5
Move in same city	5.14	15.8

brief but, at the same time, able to identify those individuals most likely to be identified as psychiatric "cases" if they were interviewed by a psychiatrist. This section reports how the index was constructed, its current state of review in the literature, and presents briefly some data regarding its validity. Finally, some of the limitations to its validity as a measure of psychiatric symptomatology are discussed.

The Health Opinion Survey (HOS)

The measure of psychiatric symptomatology used in this study is a 20-item index developed by Macmillan (1957) and refined by Leighton (1965). Macmillan distinguished his approach from other inventories by arguing that most methods attempted "to study 'personality' as a whole" without adequate theory. "Personality with all its ramifications presented too great a range in complexity of phenomena for a single test to deal with adequately" (Macmillan, 1957:326). Macmillan also cited efforts by the Armed Forces during the Second World War to develop screening devices more focused than those attempting to assess personality. After reviewing a number of screening instruments, Macmillan justified the development of a new one because "no test was found which had been standardized on small-town and rural adults--the major focus of the study in the Stirling County research" (1957:327).

Macmillan's objective was "to detect those adults whose responses to questions about their health approximated the responses of psychiatric patients, and differed from the responses of controls drawn at random from the community" (1957:327). His comparison of hospital and general population groups was based on a selection of items from the Health Opinion Survey of the Stirling County study. These had been drawn from the Army Neuropsychiatric Adjunct. Macmillan found that 40 of the 75 items used in the survey discriminated between hospital and general population groups at the $p < .01$ level.

To reduce the length of the instrument, Macmillan selected 20 items which distinguished neurotics from the sample as a whole and from subgroups within it. The weights obtained from a discriminant function analysis constituted the initial scoring of the 20-item index. Using this set of weights, Macmillan applied the measure to the community sample and found that 25% of the 419 respondents had scores in the case category. In contrast, nearly all (92%) of a sample of neurotic patients fell into that category. In addition, Macmillan had a psychiatrist visit 64 respondents from the general population and found a high correspondence between the psychiatrist's assessment and HOS scores. As a result, he concluded that the index discriminated between the general population and patients, particularly those who were neurotic.

Validity of the Health Opinion Survey

Since the time Macmillan created the index, the HOS has been used in a number of major epidemiological surveys. These include the work of Leighton et al. (1963), Gurin et al. (1960), Spiro et al. (1972), Edgerton et al. (1970), and Warheit et al. (1975a). Concurrent with this widespread application, several researchers have attempted to confirm Macmillan's original claims for validity (Spiro et al., 1972; Schwartz et al., 1973; Tousignant et al., 1974; and Kuldau et al., 1976). Most of these studies provide support for the validity of the HOS index as an epidemiological screening device, but not as a psychodiagnostic tool. Most of the above authors identify theoretical limitations of the HOS measure, but only one, Tousignant et al. (1974), appears unwilling to accept the HOS as an epidemiological tool.

Discriminatory power. Macmillan's original work suggested that the HOS is capable of discriminating neurotic patients from a normal population. Yet, no index can be properly validated against the same set of data used in its construction. Validation against new sets of data--preferably drawn from different styles of psychiatric practice--is required before firm conclusions can be reached regarding the discriminatory power of the HOS measure.

Patients versus normals. In order to evaluate the discriminatory power of the HOS, comparisons were made between the scores of the sample population and a sample of patients

recently admitted to two general psychiatric inpatient units (Kuldau et al., 1976). The HOS discriminated well, both at the level of group means and for arbitrary cutting points, as demonstrated by evaluation of the cumulative percentile distributions presented in Figure 3.1.

Additional comparisons showed that respondents in the general population possessing attributes indicating they were at high risk for psychiatric disturbance had much higher scores than individuals without these risk attributes. The scores of these individuals were nearly as high as some categories of patients. Moreover, comparisons within patient groups revealed that neurotics--the target group for the HOS measure--obtained the highest scores, while other diagnostic groups, including psychotics, scored much higher than respondents in the general population. These comparisons indicate that the HOS index does have the ability to discriminate between patients and normals.

Item content and dimensionality. Seiler (1973) has raised the issue of whether the discrimination of patients from normals provides a sufficient criterion for validity. Specifically, he expresses concern that such comparisons deflect attention from questions regarding the item content of indices such as the HOS. While these may be valid concerns, they constitute to some extent an ideal standard of validity which has not yet been attained.

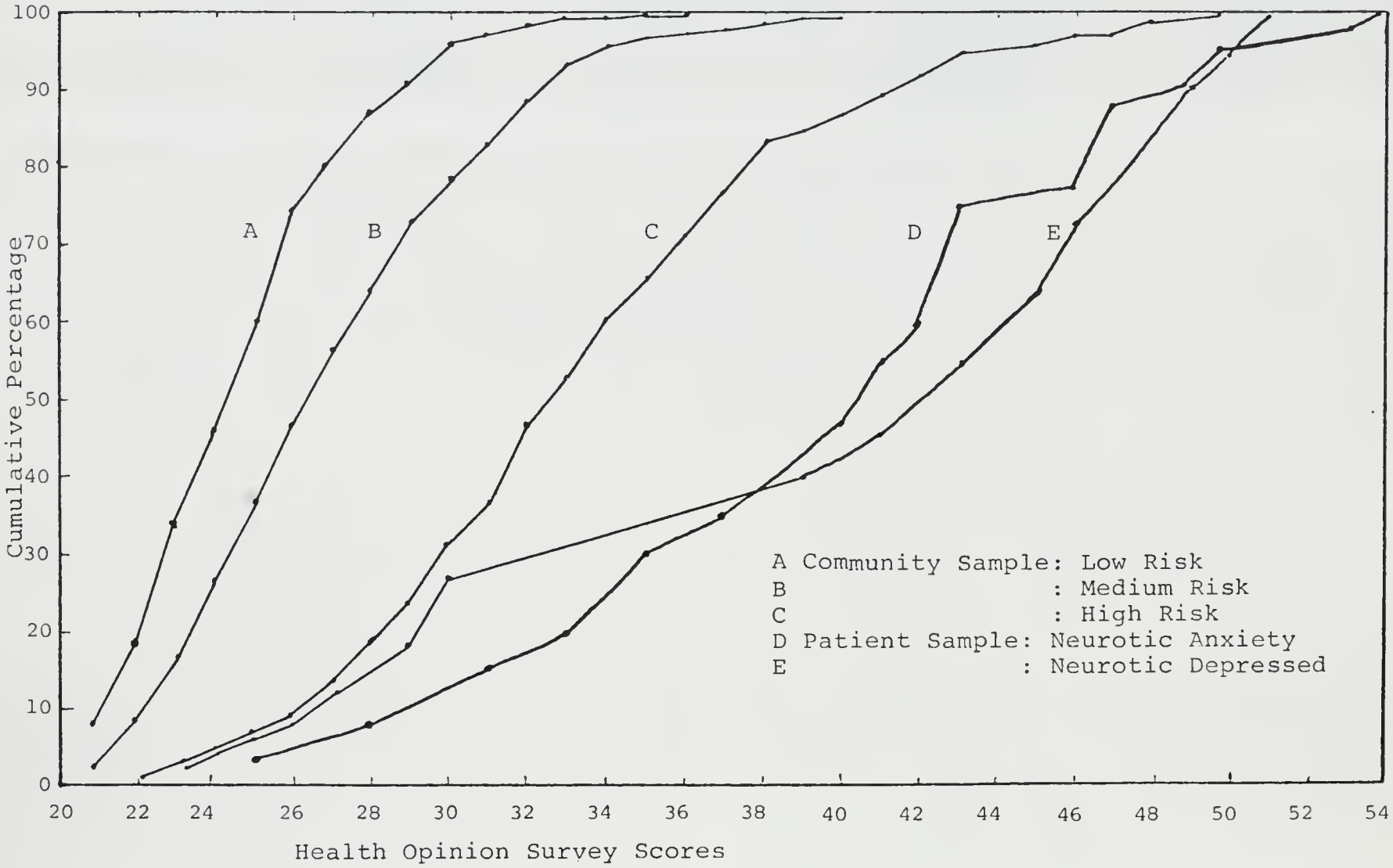


Figure 3.1 Cumulative Percentage Distributions of HOS Scores For Community and Patient Samples

Nonetheless, it is useful to ask whether the HOS index is composed of symptoms which are necessary but not sufficient indicators of mental illness. If this were the case, application of the index would overestimate the level of mental illness in a sample population. At the individual level, these cases would be false-positives. This aspect of the validity issue can be constructively addressed by studying individuals not hospitalized for mental illness but identified as cases by their HOS scores.

Another issue related to the content of the index stems from the fact that the HOS is designed to measure only a single dimension of psychiatric symptomatology, caseness. Nonetheless, many discussions consider the phenomenon to be multidimensional (cf. Jahoda, 1958; Schwab et al., 1970). While mental illness may well be a multidimensional phenomenon and should probably be understood as such, parsimony dictates that there be a point of departure for empirical analysis. The HOS is not an end in itself but rather a device for discriminating patients and non-patients which will contribute to the subsequent discovery and analysis of other dimensions of mental illness.

Stability and physical health. The two remaining issues related to the validity of the HOS are its stability over time and the strong physical health content of the component items. Does the HOS therefore measure intermittent phenomena--such as minor physical illness--which might be

assumed to vary substantially over time, or does it measure more fundamental and stable processes?

The results of comparing HOS values over the three-year period of the panel study, 1970 to 1973, reveal substantial stability (r=.73), suggesting that the HOS does measure relatively stable processes. While such a high degree of stability was unexpected and therefore may warrant further study, it indicates that the HOS definitely does not measure transient phenomena.

Transience would undermine the validity of the index in several ways: by casting doubt on the seriousness of the phenomena being measured and the consequent need for psychiatric intervention; by suggesting that the index might be tapping minor personal illnesses rather than mental illnesses; by calling into question the appropriateness of including a substantial proportion of physical health items in the index; by undermining the utility of the HOS measure in panel designs; and finally, by challenging the view that there is neither a sound theoretical nor empirical basis for dichotomizing health into physical and mental components (Schwab et al., 1970; Eastwood and Trevelyan, 1972). Fortunately, the stability of the HOS scores over a three-year period militates against these potentially negative interpretations.

Measurement of Socioeconomic Status

The SES measures constructed for the 1970 and 1973 data are based on an adaptation of the methodology reported by Nam and Powers (U.S. Bureau of the Census, 1960) but modified to provide individual instead of family SES scores. The methodology was applied using 1970 data on occupation (Nam et al., 1975), education, and income ranks.

For respondents who were unmarried, no distinction was made between family and personal SES. For married respondents who had a spouse living with them, the procedure in scoring SES was to determine the principal breadwinner. The principal breadwinner is defined as the respondent or spouse having the greater earned personal income.

National percentile ranks were obtained for each of the components of the SES measure. These included earned personal income of the respondent, the last year of education completed by the respondent, and an occupation score based on the methodology of Nam et al. (1975). The occupation scores were developed by applying the 1960 methodology to the occupation categories of the 1970 census. This methodology takes the average of income and education percentiles for each individual falling nationally within an occupational category. This average is then used to rank occupations, providing a percentile score for each occupation. These national ranks, based on aggregated values, are used as scores for individuals. The process of aggregation

and disaggregation provides an occupational ranking independent of the individual's income and education. In their 1975 report, Nam et al. provide scores based on the 1970 census for four groups: all employed males, all employed females regardless of fulltime-parttime status, all fulltime employed females, and finally, all employed individuals regardless of sex and fulltime-parttime status. It is this latter figure which is used in computing occupation scores. Because Blau and Duncan (1967) and Nam and Powers (1968) have reported great stability in the occupational structure, 1970 national norms were used for both 1970 and 1973 occupation scores. The rankings for education and income were also based on data from the 1970 census. No correction is made to the income figures to account for inflation during the three-year period because of uncertainty about an appropriate figure and because such shifts can be controlled directly in the analysis.

The individual SES score adopted for this analysis was the average of the three measures of occupation, education, and earned personal income rank scores for each respondent. In the event that one or more of these items was missing or unavailable, the SES measure was based on the average of the remaining items. A major advantage of this individual SES index is that it corresponds to the conceptual orientation advanced earlier by measuring resources available to the individual in adapting to stressful life situations.

Plan of Analysis

Using the design and operational definitions developed above, it is possible to test the working hypotheses relating life events, psychiatric symptomatology, and socioeconomic status. This section provides a detailed plan for that test of hypotheses.

Before proceeding, a comment about hypothesis testing is in order. Hypothesis testing should lend itself to the verification and refinement of propositions developed as part of a body of theory. To provide this verification, hypotheses must be falsifiable. Nonetheless, the hypotheses may relate to the parameters of a model, and thus the test involves more than the statement that a given effect is present or absent. Such an approach has been attempted in the present research. Such an estimation approach requires that the statistical models relating to the test of hypotheses be made explicit. This is accomplished in the remainder of the chapter. By convention, the $p < .05$ level of probability is used throughout the analyses as the minimum standard for rejecting the null hypothesis.

The statistical analysis of the present research consists of two major parts. The first part attempts to establish the general form of the relationship between life events, psychiatric symptomatology, and socioeconomic status, and thus focuses exclusively on the Paykel index as a measure of life events. The second part has as its purpose the

further specification of the relationships among the central variables by retesting the focal hypotheses with the alternative measures of life events. This retest serves to identify the differential influence of the various categories of life events, and thus to provide specificity to the general model developed in the first part.

The Specific Analyses: Part 1

Transition Between Caseness Categories

Because the present design permits an examination of change in symptom levels, the analysis begins with an examination of Hypothesis 1, which relates increases in HOS scores over the period of study to the occurrence of life events as measured by Paykel scores. Change can be defined in many ways. This first analysis makes use of a simple definition of change based on a dichotomization of HOS scores at the value of 30. Scores of 30 or above have been shown in the literature to correspond to elevated probabilities that the individual would be considered a "case" of psychiatric disorder were he to be examined by a psychiatrist. Therefore, if Hypothesis 1 is correct, then more frequent transition from "non-case" to possible or probable "case" levels of HOS score will be associated with high Paykel scores.

Hypothesis 2 is tested in a similar fashion through presentation of transitions from non-case to case levels on the HOS index for two levels of SES. SES scores have been

dichotomized (0-39:40-100) because the use of more categories produces cells too small for appropriate statistical test.

Through this point only those with initially low HOS scores have been considered. The above analysis is repeated for those with high initial HOS scores by using retentions within the case level of the HOS as evidence of stress.

Analysis of Change Scores

Although the previous analysis dichotomized HOS scores, a more powerful analysis might deal with change in HOS scores as an interval measure. Such an approach was used by Myers et al. (1971) and Haberman (1965) and is suggested by B.P. and B.S. Dohrenwend's (1969:128) examination of the direction of change in symptom scores. Subtraction of HOS-1970 scores from HOS-1973 scores results in a positive value for increases in level of symptomatology and negative values for decreases. Such an approach identifies change at any point of the HOS score continuum and permits the use of more powerful interval statistics. Unfortunately, however, change scores introduce a bias which undermines their attractiveness.

Bias introduced in the use of change scores is termed statistical regression toward the mean, a problem discussed most recently by Coleman (1968), Bohrnstedt (1969), and Cronbach and Furby (1970). This is a statistical effect rather than a causal factor acting on individuals, and is

based on the probability that the retest scores of an individual with extreme scores on any measure which has a component of random error will, on the average, be closer to the mean for that measure than the initial observation, other factors being equal. In short, change scores for those with very high initial symptom scores will tend to be negative and change scores for subjects with very low initial symptom scores will tend to be positive. Thus, the use of change scores introduces a bias whenever groups with selectively high initial scores are examined.

In spite of the potential for bias, it is possible to introduce a simple examination of change scores in which control variables have not selected individuals with differing levels of initial score. Such a presentation has strong intuitive appeal and sets the stage for illustration of the bias described. Thus, this preliminary test of Hypothesis 1 uses change in HOS scores as the criterion and levels of Paykel score as the independent variable. The potential bias is also illustrated.

Regression Analysis of Change in HOS Scores

A solution to the difficulties with change scores is available by adopting a least squares regression approach in which HOS-1973 scores are estimated from a model which contains HOS-1970 scores as a predictor variable. This approach has been advocated by Bohrnstedt (1969), Coleman

(1968), and Cronbach and Furby (1970). It is also incorporated into the change models of Duncan (1975b), Galtung (1975), Kenney (1973), and Pelz and Andrews (1964). It is the primary method used for the analysis of change in this study.

The simplest regression model for analyzing change within the present two-wave panel design contains two variables, the HOS-1970 and HOS-1973 scores. This model may be stated as:

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \varepsilon \qquad (3.1)$$

HOS-1973 is the dependent (time 2) variable; β_0 is a constant; HOS-1970 is the independent (time 1) variable; and ε is the term for random error. This simple model is easily estimated by ordinary least squares methods. For explicit discussion of the error term,see Bohrnstedt (1969).

In the model just described, β_1 estimates the strength of relationship between HOS-1970 and HOS-1973 scores. It may also be seen as a measure of the strength of the regression effect occurring. The term β_0 is a constant which accounts for shift in the mean HOS score level from 1970 to 1973. The error term ε is assumed to have a mean of zero but otherwise accounts for individual lack of fit in the model.

The model as stated includes no terms for estimating other influences contributing to change between 1970 and

1973. This is provided by adding an additional term.

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \beta_2 \text{ Paykel} + \varepsilon \quad (3.2)$$

The additional term consists of a life event variable and its regression coefficient. The coefficient estimates the influence of Paykel scores on HOS-1973 scores with a simultaneous control for HOS-1970 scores. It therefore provides an estimate of the influence of life events on symptom change between 1970 and 1973.

Only one term for estimation of the influence of life events upon symptom change has been considered. In fact, many additional terms might be included without affecting the method of estimation. This procedure affects the interpretation for each coefficient obtained only to the extent that additional influences are being simultaneously controlled. Additional explanatory terms are necessary, both for full elaboration of the influences of life events, and for the introduction of relevant sociodemographic controls.

Life Event and SES Interaction

Although a method has been developed for examining change in HOS scores, the regression model of Hypotheses 1 and 2 is not yet complete. The hypothesized influence of life events is positive but depends on SES. The conditional nature of this influence is termed interaction. A method must be provided for inclusion of this interaction effect in the regression model.

The additive influences of Paykel scores and SES are easily modeled as follows:

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \beta_2 \text{ Paykel} + \beta_3 \text{ SES} + \varepsilon \quad (3.3)$$

The coefficients β_2 and β_3 indicate the influence of Paykel and SES scores on HOS-1973. In particular β_2 indicates that the influence of Paykel on HOS-1973 is incrementally the same regardless of level of SES and therefore is not equivalent to the interactive relationship of Hypothesis 2. Hypothesis 2 suggests that the influence of Paykel is not the constant suggested by β_2 but rather a variable determined by the level of SES. If β_2 is assumed to be a function of SES, then the term β_2 can itself be modeled as:

$$\beta_2 = \alpha_1 + \alpha_2 \text{ SES} \quad (3.4)$$

Substituting this in the original equation provides:

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + (\alpha_1 + \alpha_2 \text{ SES}) \text{ Paykel} + \beta_3 \text{ SES} + \varepsilon \quad (3.5)$$

which expands to:

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \alpha_1 \text{ Paykel} + \alpha_2 \text{ SES x Paykel} + \beta_3 \text{ SES} + \varepsilon \quad (3.6)$$

Since the terminology of coefficients is arbitrary, the model can be restated as:

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \beta_2 \text{ Paykel} + \beta_3 \text{ SES} + \beta_4 \text{ SES x Paykel} + \varepsilon \qquad (3.7)$$

Through the formation of a new variable, SES x Paykel, this new model becomes estimable through ordinary least squares multiple regression methods. The cross product term, SES x Paykel, models the portion of the influence of Paykel on HOS-1973 which is conditional on SES, while the simple linear term, β_2 Paykel, models the unconditional portion of the relationship. Thus equation 3.7 accurately models the influence considered in Hypothesis 2, although additional sociodemographic controls may be added.

Multicollinearity. Although the inclusion of cross product terms in regression models is a common practice, it frequently creates a condition which distorts the coefficients for both the linear and interaction terms. This is the problem of multicollinearity, a result of strong interdependence among the predictor variables of the regression model (cf. Blalock, 1972:457; Huang, 1970:154). Multicollinearity produces distortions both in the size of regression coefficients and in the testing of significance for the terms affected.

The new variable used in the cross product term is formed through multiplication of two or more original variables and thus may be correlated with them (Blalock, 1972:463-364). Whether the cross product is correlated with its components depends on the distribution of those

variables about the value zero. Cross products formed from variables which have been centered, through subtraction of their means, typically provide lower correlations with their original components than cross products obtained from uncentered data. This suggests that multicollinearity due to cross products may be reduced through centering the variables before forming the cross product. The use of cross product terms formed in this way permits the estimated linear effects of the variables to be unchanged by the introduction of the cross product, while retaining an easily understood interpretation of the interaction term as an adjustment to the linear slope of the first variable based on the respondent's deviation from the mean on the second variable.

Overall, this approach is more direct and less confusing than the attempt to interpret uncentered cross products in the presence of multicollinearity, or the attempt to interpret alternative methods for controlling that multicollinearity (cf. Huang, 1970:149-150).

As a result of these considerations, the influence of life events is tested in two parts, the unconditional linear effect and the correction to the life event influences due to deviation from the mean level on the SES variable.

$$\text{HOS-1973} = \beta_0 + \beta_1 \text{ HOS-1970} + \beta_2 \text{ Paykel} + \beta_3 \text{ SES} + \beta_4 (\text{SES} - \overline{\text{SES}}) \times (\text{Paykel} - \overline{\text{Paykel}}) + \varepsilon \qquad (3.8)$$

The regression modeling of the influence of Paykel scores and SES on HOS scores both in this and subsequent sections of the analysis is based on equation 3.8 with the addition of terms for control variables. The control terms in the equation include the age of the respondent in 1970, age squared, dummy variables for race, sex, marital status, and employment status as appropriate. Additionally, a cross-product term for interaction between age and HOS-1970 is included; it is based on centered variables to reduce multicollinearity.

The preceding discussions have outlined a regression model for use in testing Hypotheses 1 and 2. The specific test of Hypothesis 1 is a test of whether the regression coefficient for the linear effect of Paykel scores, β_2, is significantly greater than zero. The test of Hypothesis 2 is a test of whether the regression coefficient for the cross product of Paykel scores and SES is significantly less than zero. This coefficient is negative due to the inverse relationship of SES to HOS scores.

Regression Model Predicting Life Events

The fourth analysis provides a test of Hypothesis 3. It examines the influence of initial levels of psychiatric symptomatology, HOS-1970, on the events occurring during the following three years. This analysis makes use of multiple regression, in particular, the following model:

$$\text{Paykel} = \beta_0 + \beta_1 \text{ HOS-1970} + \text{control terms} + \varepsilon \qquad (3.9)$$

The control terms are selected as appropriate from those identified in the above analysis, with the exception that only 1970 values are used. The test of Hypothesis 3 in terms of this model is a test of whether the regression coefficient for the HOS-1970 term, β_1, is significantly greater than zero.

Cross-Sectional Models for HOS-1973

Although longitudinal studies of the influence of life events are preferable to cross-sectional ones, few such studies have been reported, and thus cross-sectional analyses are a major point of comparison between the literature and the present study. In addition, a comparison of cross-sectional and panel analyses serves to highlight the differences between interpretation of our hypotheses as change within individuals and differences among individuals. To this end, Hypotheses 1 and 2 are retested using the 1973 cross section. An analysis for the 1970 cross section is not possible due to the lack of event data for that interview period.

The model for testing the hypotheses cross-sectionally is different from the panel model in only two terms. These are the terms for HOS-1970 and for HOS-1970 x age, a control term. Thus, the regression equation is as follows:

$$\text{HOS-1973} = \beta_0 + \beta_2 \text{ Paykel} + \beta_3 \text{ SES} + \beta_4 (\text{Paykel} - \overline{\text{Paykel}}) \times (\text{SES} - \overline{\text{SES}}) + \text{controls} + \varepsilon \qquad (3.10)$$

The cross-sectional test of Hypothesis 1 is a test that the regression coefficient for the Paykel term, β_2, is greater than zero. The verification of Hypothesis 2, that SES determines the strength of influence of life events on symptomatology, requires that the regression coefficient for the cross-product term, β_4, be less than zero. As in the panel analysis, this coefficient must be negative due to the inverse relationship between SES and HOS scores.

The Specific Analyses: Part 2

In Part 1 of the analyses, outlined above, the life event variable used in each test of hypotheses was the Paykel index. This index is based on a single formulation of events, the typical amount of upset produced. As a single index, the Paykel measure provides no means for assessment of the differential impact of events of differing types.

The purpose of the second part of the analysis is to provide greater specificity to our knowledge by retesting the hypotheses with the alternative measures of life events detailed above. Such a detailed examination, although exploratory, can serve to refine the general model and to suggest improvements in the measurement of life events.

Weighted Versus Unweighted Paykel Measures

The next analysis is a comparison of the unweighted version of the Paykel index with the Paykel index used in the analyses above. The hypotheses tested correspond to panel versions of all three hypotheses. This test addresses whether weighting of items by the typical level of upset provides a model different from the one obtained above. This difference is assessed in terms of the amount of variance explained and the change in standardized partial regression coefficients.

The second analysis involves the use of individual events in test of Hypothesis 1. Because a large number of items are considered, the interaction of each item with SES is ignored and stepwise forward selection is used in obtaining a solution to the model. In this procedure, items are entered in order of their contribution to the regression equation at the end of the previous step. Thus, at each step, the item adding the most to the prediction achieved in the previous step is entered. The procedure of adding variables is terminated when no additional variable makes a significant increase in the prediction. This procedure serves to identify the events most strongly predicting change in HOS scores but cannot provide an adequate estimate of influence for each of the 61 events in Paykel's list.

Entrances and Exits

The next analysis is a retest of the hypotheses using two event measures, one measuring entrances to the social field and the other measuring exits. This test of Hypotheses 1 and 2 identifies the measure with greater power to predict change in HOS scores. The regression model and test of hypotheses differ from the prior model of change in HOS scores only in the duplication of life event terms considered. Analyses equivalent to those on page 67 are used to test Hypothesis 3. This is done separately for the two event variables.

Symptom Relatedness of Life Events

This analysis is focused on the issue addressed by Hypothesis 3, the dependence of events on prior levels of symptomatology. Although Hypothesis 3 is addressed directly in the section on regression model predicting life events, this additional test helps to specify the particular kinds of events involved. Based on theoretical and intuitive judgments, items are classified by symptom relatedness. If Hypothesis 3 is correct and the judgments about symptom relatedness are correct, the three hypotheses should be most strongly supported for symptom related events.

Life Events by Area of Activity

This analysis seeks to identify by area of social activity the types of events for which the hypotheses hold

true. The literature reviewed above suggests personal health is the area most related to the production of psychiatric symptomatology (cf. Selye, 1957; B. P. Dohrenwend, 1974). Once again, the test of three hypotheses is parallel to the above panel analyses.

Analysis by Year of Occurrence

The last analysis to be included in this report deals with the time interval in which each event occurred. Through this point in the analysis, all events are treated alike regardless of when they occurred during the three-year period of the panel design. Yet, as was discussed earlier, the recency of events may be of importance if their major effects are transient rather than long-term. The effects examined are long-term ones; and the design was developed accordingly. Long-term effects of this type should show an impact from events from all three years of the study. In contrast, a preponderance of transient effects would cause the observed influence of events on symptoms in 1973 to be limited to those events occurring most recently (i.e., Paykel, 1973). Thus a reexamination of Hypotheses 1 and 2 provides a test of one of the assumptions of the present design.

CHAPTER 4

FINDINGS AND DISCUSSION

The purpose of this chapter is to test the working hypotheses with the data from the present study. The first part of this analysis establishes the form and extent of the interrelationship between Paykel scores, HOS scores and SES; the second part retests the hypotheses with life event measures other than the overall Paykel index. These analyses identify the life event measures for which the hypotheses hold true and thereby identify the sets of life events with the greatest impact on HOS scores.

Distribution of Variables

The distributions of the variables used in the analyses are presented in Tables 4.1 and 4.2 so that the reader will be better able to interpret the analyses which follow. One important comment is that many of the variables, particularly HOS and life event measures, are highly skewed with many observations several standard deviations above the mean. This skew is a natural phenomenon consistent with assumptions about true distributions of the variables involved. As a consequence, no transformation has been used.

Table 4.1 Means and Standard Deviations for Major Variables from 1970 and 1973 Surveys

	N	1970 Mean	1970 S.D.	1973 Mean	1973 S.D.	Correlation Between Years
HOS	517	27.64	5.65	27.99	5.98	.73
SES	517	55.50	27.47	56.51	28.49	.88
Age*	517	47.00	16.45	--	--	--
Sex (female)[#,†]	517	.59	.49	--	--	--
Race (black)[#,†]	517	.26	.44	--	--	--
Unemployed (yes)[†]	517	.42	.49	.42	.49	.65
Not married (yes)[†]	517	.32	.46	.33	.47	.81

*Age for 1970 is used throughout, in order to avoid introduction of spurious variance due to birth date.
[#]Sex and race are constant over the three-year period.
[†]The means for the dummy variables are proportions of respondents in the specified category, and may be converted to percentages through multiplication by 100.

Table 4.2 Means and Standard Deviations for Life Event Measures

Event Measure (Number of Items)		Event Item Count Mean (N=517)	Event Item Count S.D.	Weighted Score Mean (N=517)	Weighted Score S.D.	Average Upset Weight
Total Paykel	(61)	4.73	3.57	53.10	39.56	11.23
Relation to Social Field						
Exits	(13)	1.27	1.09	16.91	14.19	13.31
Entrances	(6)	.33	.63	2.41	4.59	7.30
Relationship to Symptomatology						
Independent	(13)	1.47	1.16	21.19	16.45	14.41
Dependent	(19)	.83	1.22	9.06	14.97	10.91
Unknown	(29)	2.42	2.35	22.86	22.84	9.45
Area of Living						
Education	(5)	.20	.54	1.58	4.55	7.9
Work	(9)	.69	1.14	6.91	11.97	10.01
Legal & Financial	(8)	.80	.98	10.08	12.39	12.60
Personal Health	(8)	.66	.83	6.34	8.81	9.61
Family	(10)	1.22	1.17	15.46	13.51	12.67
Marital	(12)	.39	.81	4.38	9.65	11.23
Other Social	(9)	.77	.89	8.33	9.66	10.82
Year of Occurrence						
Paykel-1971	(61)	.91	1.16	10.08	13.38	11.08
Paykel-1972	(61)	.99	1.22	10.82	13.88	10.93
Paykel-1973	(61)	1.94	1.98	21.03	22.17	10.84

The main consequence of the use of such skewed data is likely to be an increased estimate of error variance, and thus any bias occurring is likely to be in the direction of accepting the null hypothesis. Additional support for this expected conservatism is seen in slight increases in the coefficient of determination when data from the full 1970 survey were redistributed in the form of a normal distribution.

The Form and Strength of the Relationship

Analysis of Transition Between HOS Caseness Categories

An initial test of Hypotheses 1 and 2 is based on treatment of HOS scores as a dichotomy between those with low (non-case) levels of symptomatology (HOS=20-29) and those with high (case) levels (HOS=30+).

The left-hand column of Table 4.3 reports only those respondents with the HOS-1970 scores below the caseness level. The figures presented for each level of Paykel score show the percentage of respondents with low 1970 scores but whose HOS-1973 scores had increased to the case level. Hypothesis 1 states that those with high Paykel scores experience greater increases in symptomatology. This is supported because the percentage of respondents whose scores increased to caseness levels is nearly 20.7%, nearly double the 10.4% and 11.6% found for the middle and lower

Table 4.3 Transition of Respondents Between Case Categories by Paykel Scores, Controlling for SES Level

	Transition from Non-Case to Case			Transition from Case to Non-Case		
	Number of Non-Cases, 1970	Percentage Becoming a Case		Number of Cases, 1970	Percentage Remaining in the Case Level	
All Respondents						
Paykel Score						
0-31.00	121	11.6	$\chi^2 = 6.21$	46	52.2	$\chi^2 = 11.43$
31.01-62.00	125	10.4	$p < .05$	47	76.6	$p < .01$
62.01 +	116	20.7		62	80.6	
SES Levels 0-39						
Paykel Score						
0-31.00	38	13.2	$\chi^2 = 7.48$	16	75.0	$\chi^2 = 3.26$
31.01-62.00	33	21.2	$p < .05$	28	92.9	N.S.
62.01 +	23	43.5		30	90.0	
SES Levels 40-100						
Paykel Score						
0-31.00	83	10.8	$\chi^2 = 3.49$	30	40.0	$\chi^2 = 6.45$
31.01-62.00	92	6.5	N.S.	19	52.6	$p < .05$
62.01 +	93	15.1		32	71.9	

Paykel levels. The initial test of Hypothesis 2 states that the differences in transitions by Paykel level should be greater for the lower SES levels than for higher SES levels. This also is supported. For those with low SES scores and high Paykel scores the percentage with HOS scores increasing from non-case to case levels is 43.5%, more than three times that for the low Paykel score group. In contrast, the differences in transition between high and low Paykel levels for the high SES group is slight, being only 15.1% and 10.8%, respectively. Thus, life event scores are associated with increased changes from non-case to case levels on the HOS. The strength of that association is greater for those with low SES levels.

The right-hand side of Table 4.3 presents the effect of life events on those who had high initial HOS scores. Hypothesis 1 is again supported by the greater retention at the case level of those with high Paykel scores. The retest of Hypothesis 2 fails in this particular context. Although retention of respondents in the case category was associated with Paykel scores at both levels of SES, the influence was great or greater for those with high SES. This may reflect a ceiling effect, because nearly all of the 30 respondents in the high Paykel-low SES category (90%) were retained at the case level.

Analysis of HOS Change Scores

A second analysis, to be considered only briefly, is the analysis of HOS change scores. Table 4.4 presents the mean of HOS change scores for three levels of Paykel scores. As can be seen, those with highest Paykel scores show a slightly greater increase in HOS levels than the other groups, but not enough to reject the null Hypothesis 1 that no relationship exists between Paykel scores and change in HOS scores. Thus, Hypothesis 1 is not supported by analysis of uncontrolled change scores.

The remainder of the table confirms the methodological assumption that change scores will, on the average, be positive for low initial HOS values and negative for higher initial HOS values.

Regression Model of the Change in HOS Scores

In the methods chapter, a regression model for the analysis of change in HOS scores has been formulated. This regression equation predicts HOS-1973 scores from HOS-1970 scores, Paykel scores for the period from 1970 to 1973, the respondent's SES in 1973, and additional control variables for age, sex, race, and employment. Several of these variables have been handled in special ways. One term, included to model the interaction between Paykel and SES scores, is the product of the Paykel and SES scores, formed after

Table 4.4 Change in HOS Scores by Paykel Scores, Controlling for 1970 HOS Scores

	N	Mean	S.D.	Significance
Total	517	.3501	4.2808	
Paykel Score				
0-31.00	167	.168	3.865	F = 1.43
31.01-62.00	172	.076	3.798	df = 2,514
62.01 +	178	.787	5.019	N.S.
		Non-Case (HOS 20-29)		
Paykel Score				
0-31.00	121	.983	3.050	
31.01-62.00	125	.528	3.330	
62.01 +	116	1.414	4.348	
		Possible Case (HOS 30-34)		
Paykel Score				
0-31.00	35	-1.343	4.172	
31.01-62.00	26	-1.269	4.441	
62.01 +	33	1.848	4.969	
		Probable Case (HOS 35+)		
Paykel Score				
0-31.00	11	-4.000	6.481	
31.01-62.00	21	-0.952	5.015	
62.01 +	29	-2.931	6.006	

subtraction of their respective means. Among the control variables, the square of age, after subtraction of its mean, and the product of age and HOS-1970 after subtraction of their means are included. The two remaining control variables, race and employment, are treated as dummy variables: race (black=1) and employment (not employed=1). The remaining categories of the dummy variables are coded as zero.

Estimation of this regression model from the present data (Table 4.5) reveals that the major determinant of HOS-1973 scores is the respondent's HOS-1970 score. Although this was anticipated, the strength of the prediction of HOS-1973 scores by HOS-1970 scores is greater than expected for a three-year period, explaining 53.4% of the HOS-1973 score variance. This stability of HOS scores over time can be considered as partial confirmation of the reliability of the HOS measure, but consideration should be given to the other factors which may govern this stability.

The two hypotheses to be examined concern the influence of Paykel scores. The first, Hypothesis 1, examines the linear effect of Paykel scores on the change in HOS scores. The metric regression coefficient for the Paykel term is β=.02209 indicating an increase in HOS scores of only two-tenths of a point for 10 points on the Paykel measure, or 2.2 points for 100 points on the Paykel measure. Ten points on the Paykel corresponds to a single event producing only a

Table 4.5 Regression Analysis of 1973 HOS Scores as Change from 1970 HOS Scores, Using Paykel Scores and SES Level as Predictors

Variable	Regression Coefficients: Metric Beta	Regression Coefficients: Standardized Beta	Regression Coefficients: Standard Error Beta	F	Significance
HOS-1970	0.64917	0.61304	0.03262	395.970	$p < .001$
SES-1973	-0.02799	-0.13330	0.00737	14.412	$p < .001$
Paykel	0.02209	0.14608	0.00470	22.093	$p < .001$
SES x Paykel*	-0.00050	-0.08380	0.00017	8.628	$p < .01$
Age	0.01525	0.04194	0.01255	1.477	N.S.
Age Squared	-0.00182	-0.08790	0.00061	8.899	$p < .01$
HOS x Age*	0.00737	0.11396	0.00187	15.591	$p < .001$
Race-Black	1.08978	0.08047	0.43551	6.262	$p < .01$
Not Employed-1973	1.32949	0.10992	0.39367	11.405	$p < .001$
(Constant)	1.19247				

*Variables were centered before cross-product was formed.

Multiple R = 0.77940

R Squared = 0.60746

Adjusted R Squared = 0.60049

Standard Error = 3.78116

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	9	11217.27	1246.56	87.18	$p < .001$
Residual	507	7248.66	14.30		
Total	516	18465.93			

moderate amount of upset for the average person. One point on the HOS corresponds to increased occurrence of one symptom. The interaction between Paykel and SES, modeled as the cross product of Paykel and SES after subtraction of their means, measures the change in the average influence of Paykel scores for deviation from the mean SES score. Thus, the influence for Paykel scores, given above, represents an average or typical influence which varies with level of SES. The interaction term has a coefficient of $\beta=-.0005$, indicating that a decrease in SES produces an increase in the change in HOS scores for every unit on the Paykel. This change in the estimated influence of Paykel scores is nearly as great as the strength of the Paykel coefficient itself. Over the 100 point variation of SES the change in the Paykel coefficient is estimated to be .05, and thus the influence of life events varies from zero through twice the average influence of life events, depending on the level of SES. Thus both Hypothesis 1 and Hypothesis 2 are supported. These state that life events have an influence on symptomatology, and that the strength of that influence increases with decreasing socioeconomic status.

In the tests of hypotheses above, the regression model provides control for a number of additional variables. This control takes the form of an implicit linear adjustment of the dependent variable for the effects of the controlled

variables. The effects of these variables must, therefore, be noted.

Three of the control variables involve age. The first of these, age, provides almost no contribution to the model but is retained as the base for the second-order age terms. An age-squared influence is present, indicating greater increases in symptom level for the middle-aged than for the very old or the young. The term, HOS-1970 times age, indicates that older individuals who also have high HOS-1970 scores experience greater increases in symptomatology than their younger or low-symptom counterparts. Blacks have greater increases in symptomatology over the three-year period than their white counterparts. Finally, the lack of current employment (in 1973) is also associated with increases in symptom level. Each of these additional controls, although not included in our formal hypotheses, is related to the individual's typical access to the resources required to meet demands posed by life events. Thus they also tend to support the general stress formulation adopted for this analysis.

The presentation of a graph helps in the understanding of the above effects. Figure 4.1 is a two-dimensional representation of the relationship between Leighton HOS scores in 1973 relative to the weighted Paykel life event scores, assuming all other variables, including HOS-1970

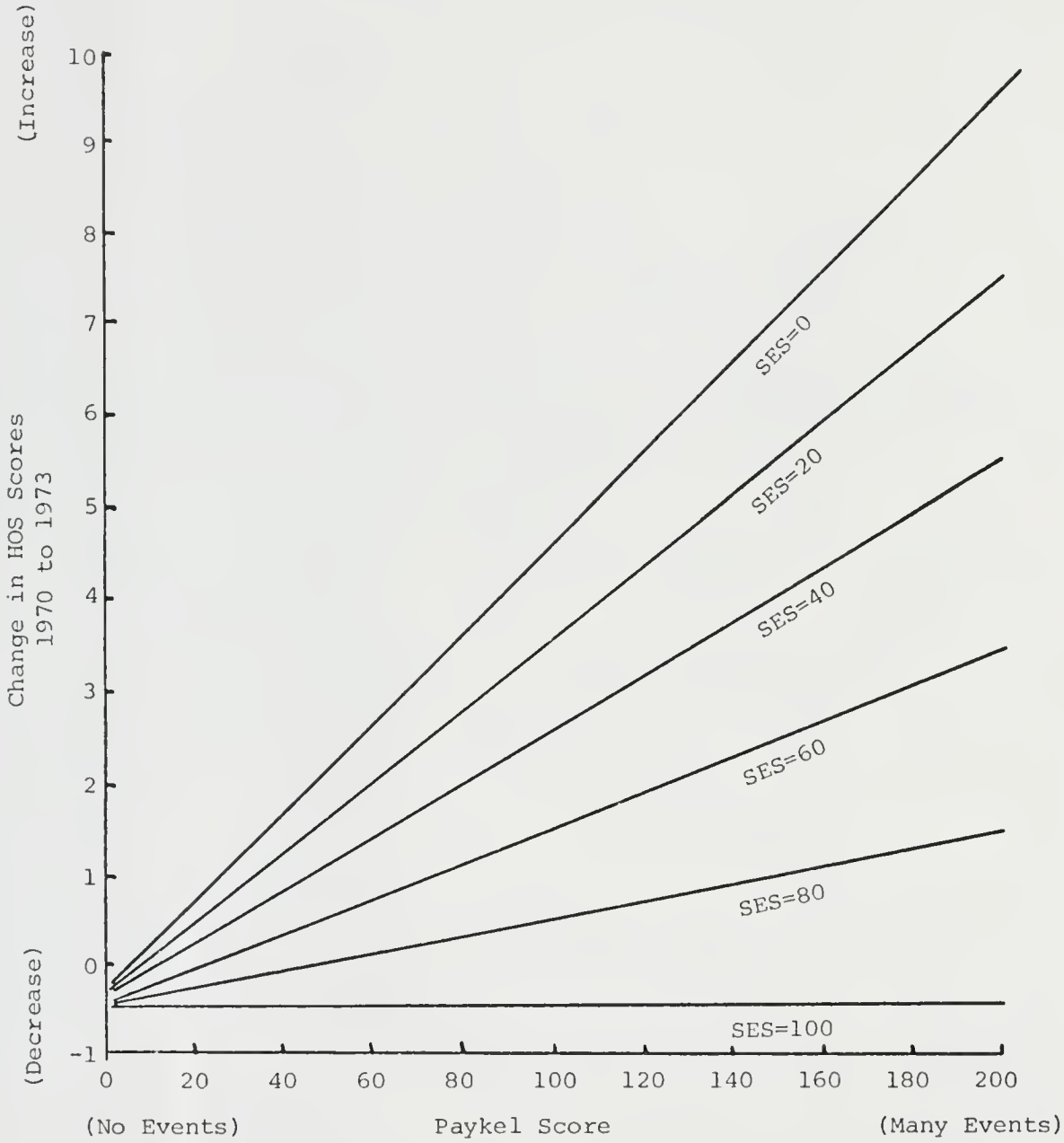
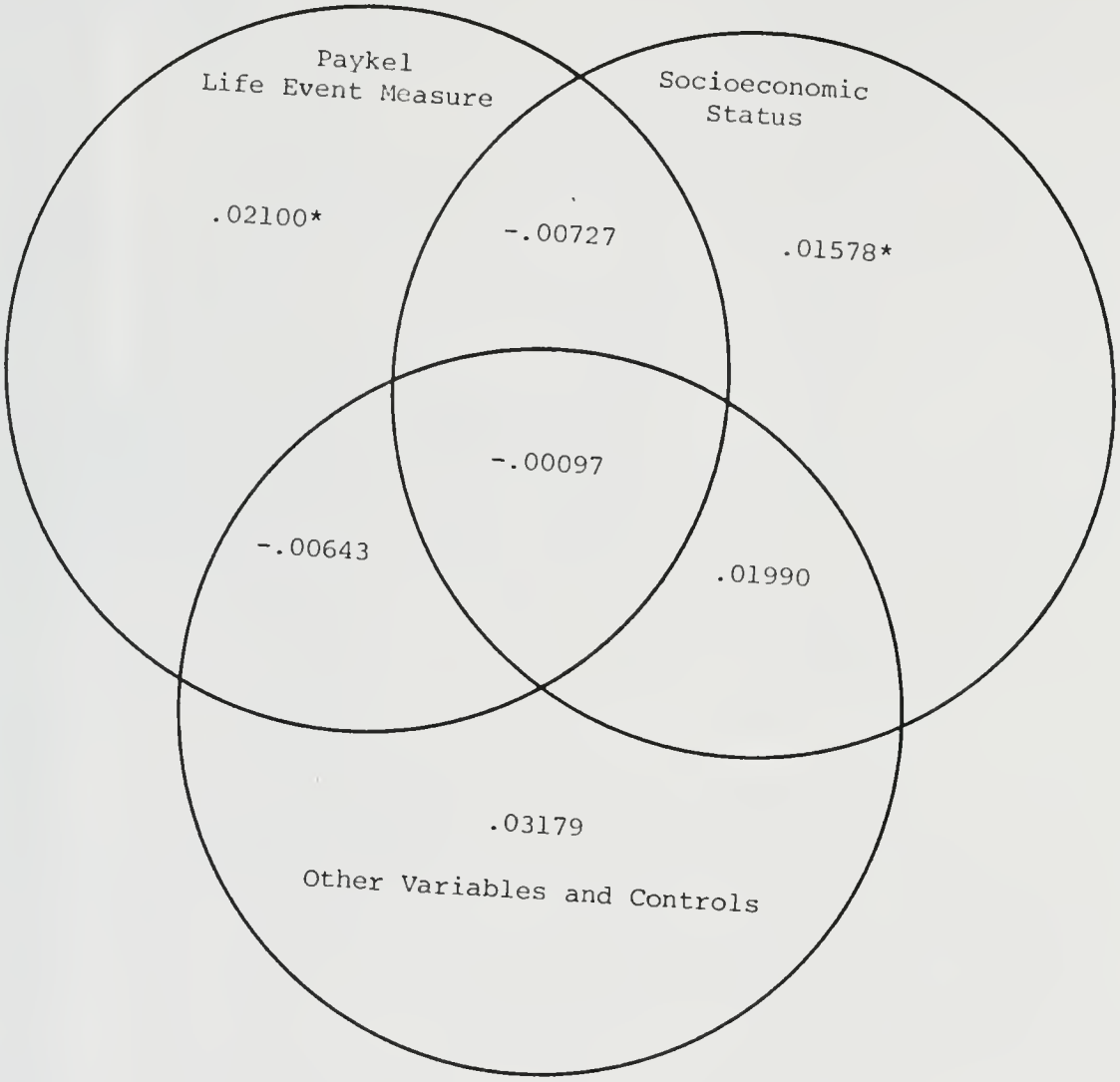


Figure 4.1 Estimated Change in HOS Scores Between 1970 and 1973 by Paykel Score and Level of 1973 SES (estimated based on the regression equation in Table 4.5, with mean values substituted for the demographic control variables)

scores, take the values of their respective means. The slope represents change from 1970 to 1973 in HOS scores relative to life event scores. On the graph six different lines are presented, one for each of six levels of respondent's SES. At high levels of the SES scale the slope is almost flat, indicating very little change in HOS scores as the result of life events. The graph also presents the relationship between life events and HOS scores for low SES scores. This slope is considerably greater than for any of the intervening levels of SES. Thus, for those with low SES, each unit of change on the life event measure yields a greater increase in Leighton HOS scores than was found for individuals with higher levels of SES.

Partition of explanatory variance. Partitioning of the explanatory variance into components which correspond to sets of variables is a method which provides clarification of the extent to which these variables are redundant in their explanatory power, or are synergistic, together providing a greater explanation than they could provide separately.

Figure 4.2 presents a partitioning of the variance from the above regression model. The variables are presented in four sets. The first, HOS-1970, is used as a base such that all other components of variation are interpreted as explaining change in HOS scores. The variables Paykel-weighted and SES are identified separately, and the final set includes all



NOTES:
Total R^2=.60746 when HOS-1970 is included.
HOS-1970 alone has an R^2=.53366.
The increase due to the variables given is R^2=.07380.
Entries are the increment in R^2 for the given combination of independent variables.
*Indicates inclusion of Paykel X SES term in the total equation.

Figure 4.2 Partitions of Explanatory Variance for HOS-1973 Scores As An Increment From HOS-1970 Scores

of the control variables. The variance explained by interaction terms containing variables from two sets is included in the component overlapping both sets. These interaction terms contribute substantially to the synergistic effect observed for the overlap of SES and Paykel components.

The outer components, consisting of variables not overlapping with any other set, are termed unique variance and correspond to squared part-correlations of that set with the dependent HOS-1973 scores, controlling all other variables. Interaction terms are included where appropriate. The areas of overlap are components of shared variance. Positive values indicate redundancy and negative values indicate synergistic effects.

One finding of this analysis is the small contribution of these variables relative to the overwhelming influence of 1970 HOS scores. Although Paykel scores make a significant contribution, the size of that contribution is sufficiently small that interpretation of life events as a major determinant of three-year changes in level of sympomatology remains very much open to question. Clearly the other factors are as predictive of these changes as the Paykel scores.

The Dependence of Life Events on Previous Symptomatology and Sociodemographic Factors

The present section tests Hypothesis 3, the influence of HOS-1970 scores, in conjunction with sociodemographic

variables, on occurrence of life events during the period from 1970 to 1973. Because the occurrence of life events for the years preceding 1970 was not measured, it is not possible to examine the occurrence of life events prior to that date. Thus, the analysis of life events in this section deals with lagged associations across, rather than changes within, individuals. The time lag after measurement of HOS scores in 1970 provides partial protection from response biases, particularly those which certainly would have resulted from retrospective estimates of 1970 symptomatology.

Table 4.6 presents a regression equation estimating the respondent's Paykel score for the period from 1970 to 1973. This model accounts for 18.1% of the Paykel score variance. The predictor variable of primary interest, the HOS-1970 score, is included first as a linear term and also as an interaction with age. The linear term for HOS scores yields a standardized regression coefficient of $\beta=.25377$, reaching a high level of statistical significance, although it predicts only a small percentage of Paykel score variation. This HOS linear term explains only 5.5% of the Paykel variance beyond that explained by the other variables. The interaction term, HOS times age, makes an additional contribution to the explanation, contributing 1.2% of unique variance to the overall regression. It had a standardized beta of $\beta=-.11349$, which indicates that life events not only occur

Table 4.6 Regression Analysis of Paykel Scores Using HOS-1970 Scores as a Predictor

Variable	Regression Coefficients: Metric Beta	Regression Coefficients: Standardized Beta	Regression Coefficients: Standard Error Beta	F	Significance
HOS-1970	1.77690	0.25377	0.30485	33.974	$p < .001$
SES-1970	0.10058	0.06986	0.07549	1.775	N.S.
Age	-0.86744	-0.36084	0.10803	64.478	$p < .001$
Age Squared	0.01706	0.12464	0.00588	8.414	$p < .01$
HOS-1970 x Age	-0.04851	-0.11349	0.01762	7.583	$p < .01$
Race-Black	8.72325	0.09742	4.24485	4.223	$p < .05$
Not Employed-1970	-0.89080	-0.01113	3.59463	0.061	N.S.
(Constant)	96.46907				

Multiple R = 0.42562

R Squared = 0.18115

Adjusted R Squared = 0.16989

Standard Error = 36.03926

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	7	146256.27	20893.75	16.09	$p < .001$
Residual	509	661103.64	1298.83		
Total	516	807359.91			

more frequently for those with previous symptomatology, but that this effect is more pronounced for the young than for the old. These findings provide strong support for Hypothesis 3.

Consideration of other terms in the model reveals a decrease in Paykel scores with advancing age, although the presence of the age-squared term suggests this effect levels off for the very old. The dummy variable for race indicates a higher overall occurrence of events for blacks. SES and unemployment make little contribution to the overall explanation.

The regression model suggests that while age is the primary influence on the occurrence of life events, previous levels of symptomatology make a substantial contribution. These influences are found in spite of the likelihood that many of the events within the Paykel inventory occur for reasons well beyond the voluntary or involuntary influence of the respondent. The contributions of these specific types of events to the above dependence of events on HOS scores are examined in a later section.

Consideration of the Reciprocal Relationship Between HOS and Paykel

The previous sections have demonstrated that Paykel scores influence subsequent HOS levels, and that HOS levels influence both the occurrence of life events and the

subsequent level of symptomatology. Because the passage of time is involved, it is possible to conceive the relationship between life events and symptomatology as reciprocal over time.

According to Duncan (1975a), direct and indirect relationships between two variables may be elucidated through use of the multiplication rule. The direct effect of HOS-1970 on HOS-1973 is estimated by the standardized β=.61304. But it has been shown that HOS-1970 influences Paykel scores which in turn influence HOS-1973 scores. This is termed an indirect effect of HOS-1970 on HOS-1973. The concern here is whether the influence of life events is primarily an indirect effect of HOS-1970. The multiplication rule (Duncan, 1975a:36) is based on estimation of the influence along any particular causal chain from the product of the coefficients along that path. In metric form these are β=.02209 for the influence of HOS-1970 and β=1.7769 for the influence of Paykel scores, which, when multiplied, produce the value .04, indicating that only a small proportion (4%) of the Paykel influence on HOS-1973 scores is due to the prior influence of HOS-1970 scores on Paykel scores.

Cross-Sectional Analysis

Despite the desirability of using panel approaches in the study of life events, few such studies have been conducted. As a consequence, many studies which might have

provided a basis for evaluating these findings were limited to the reporting of synchronic correlations based on cross-sectional data. In order to facilitate comparison with these studies and illustrate the differences obtained using each approach, a cross-sectional analysis, parallel to the panel analysis presented above, has been used to reexamine Hypotheses 1 and 2. In this instance the hypotheses are interpreted as statements about associations across respondents rather than as change within respondents over time.

The difference between the panel and cross-sectional models is the exclusion from the latter of the two time-lagged terms, HOS-1970 and HOS times age. All variables in this analysis are based on the 1973 survey. The life event measure is based on 1973 data because it consists of retrospective reporting, although it refers to the three-year time period from 1970 to 1973.

The cross-sectional regression model presented in Table 4.7 explains 25.9% of the variance of the HOS-1973 scores. The significance of the Paykel term supports Hypothesis 1 and the interaction of Paykel and SES supports Hypothesis 2. SES is also significant.

These regression coefficients are uniformly larger than their equivalents in the panel analysis, even though the total explained variance is much smaller. This difference reflects the absence of control for HOS-1970 scores

Table 4.7 Cross-sectional Regression Analysis of HOS-1973 Scores, Using Weighted Paykel Scores as a Predictor

Variable	Regression Coefficients: Metric Beta	Standardized Beta	Standard Error Beta	F	Significance
HOS-1970*	----	----	----	----	----
SES-1973	-0.06078	-0.28945	0.00986	38.025	$p < .001$
Paykel Weighted	0.04316	0.28541	0.00620	48.426	$p < .001$
SES x Paykel#	-0.00080	-0.13513	0.00023	12.103	$p < .001$
Age†	0.04553	0.12525	0.01706	7.125	$p < .01$
Age Squared#	-0.00210	-0.10159	0.00082	6.533	$p < .01$
HOS-1970 x Age*	----	----	----	----	----
Race-Black	1.02248	0.07551	0.59495	2.954	N.S.
Not Employed-1973	2.23625	0.18489	0.53643	17.378	$p < .001$
(Constant)	28.77485				

*Omitted to obtain a cross-sectional analysis.
#Means were subtracted prior to multiplication to reduce multicollinearity.
†Age from 1970 was used, but this was verified to be equivalent to Age in 1973 minus 3 years.

Multiple R = 0.50885

R Squared = 0.25892

Adjusted R Squared = 0.24873

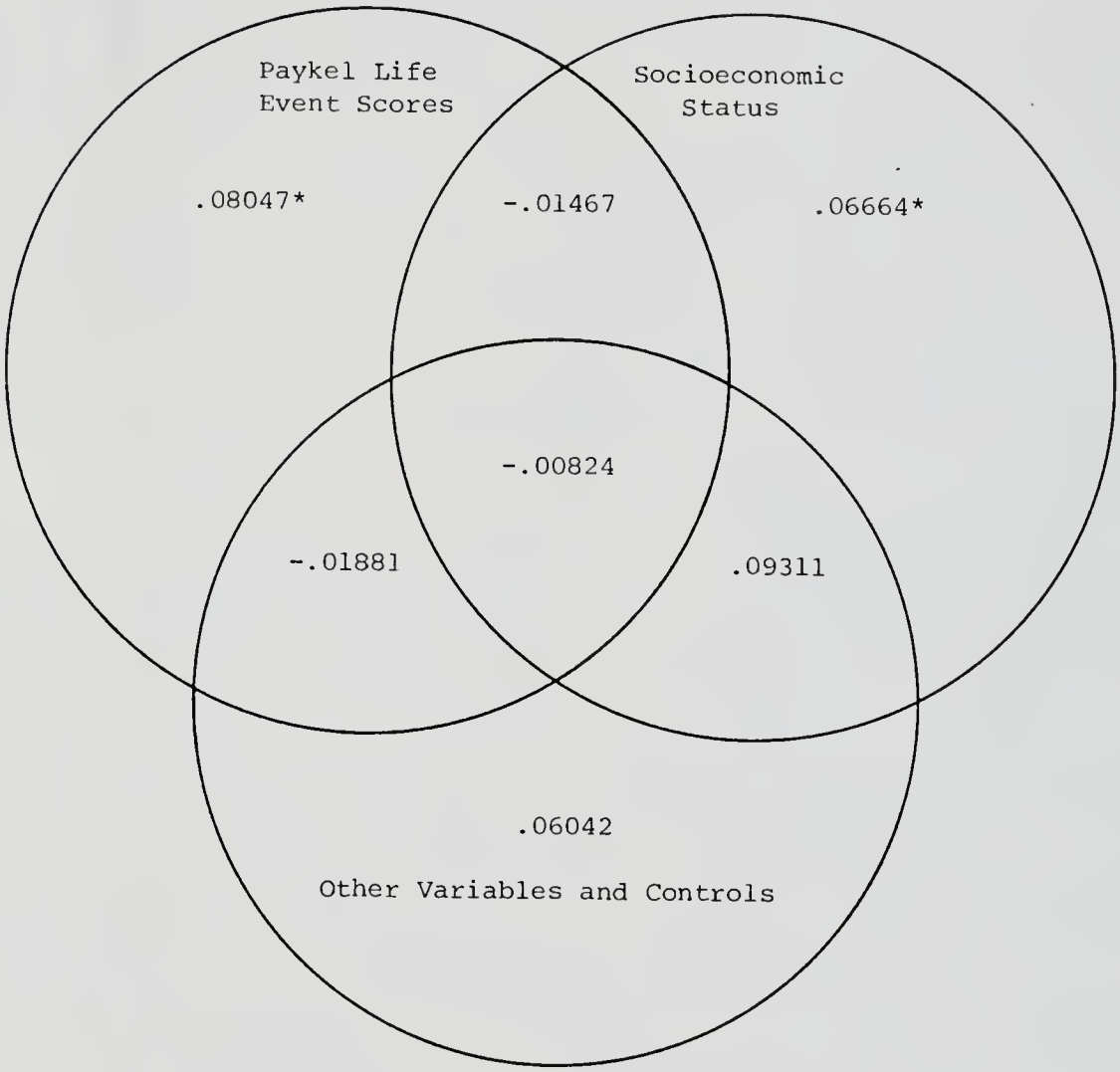
Standard Error = 5.18511

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	7	4781.29	683.04	25.41	$p < .001$
Residual	509	13684.64	26.89		
Total	516	18465.93			

in the present model. Because HOS-1970 explains so much of the variance in the panel analysis, the variance of that model remaining to be explained by these variables is less than in the cross-sectional analysis. The demographic relationships change slightly, with an increased influence of age and a decreased influence for race. The reduced significance may partially be due to multicollinearity with SES (r=-.48).

The differences between the panel and cross-sectional analyses are further emphasized through presentation of a partitioning of the variance of the cross-sectional regression. As can be seen in Figure 4.3, each of the components of the cross-sectional analysis explains a greater portion of variance than its counterpart in the panel analysis, even though the panel analysis explains a greater total amount of the variance. The difference between the two approaches is that the panel analysis uses the HOS-1970 levels as a control and removes the Paykel and SES variance associated with the HOS-1970 scores from the estimates of their influence on the HOS-1973 scores. This is because the panel analysis is being used to estimate <u>change</u> over time within individuals, rather than the <u>associations</u> across individuals estimated by cross-sectional analysis.



NOTES:
Total R^2=.25892
Entries are increments in R^2 for the given combination of independent variables.
*Indicates inclusion of Paykel X SES interaction term.

Figure 4.3 Partition of Explanatory Variance for HOS-1973 Scores From Cross-sectional Analysis

Examination of Alternative Life Event Measures

Part one of this analysis tests each of the hypotheses using the Paykel index as a measure of demand created by life events. This second part of the analysis reexamines those hypotheses to establish the types of life events to which they apply.

Weighted Versus Unweighted Paykel Scores

A first examination of the generality of the hypotheses is obtained through comparison of weighted and unweighted versions of the Paykel measure. Because the two measures are highly correlated (r=.96), little difference in the regression models is expected.

Hypotheses 1 and 2. Table 4.8 presents the unweighted Paykel index substituted into the original regression models testing Hypotheses 1 and 2. As expected, little difference is observed, there being a slight decrease in the overall predictive power. Although this decrease is small (0.66%), particularly in comparison to the size of the overall prediction (60.18%), it is sufficient to justify the use of weighting because the amount of unique influence of Paykel scores is only 2.1%. Nonetheless, Hypotheses 1 and 2 continue to be supported.

Hypothesis 3. Retest of the influence of HOS-1970 scores on Paykel scores also supports the use of the weighted index.

Table 4.8 Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores, Using Unweighted Paykel Scores as a Predictor

Variable	Regression Coefficients: Metric Beta	Regression Coefficients: Standardized Beta	Regression Coefficients: Standard Error Beta	F	Significance
HOS-1970	0.65715	0.62057	0.03277	402.238	$p < .001$
SES-1973	-0.02913	-0.13870	0.00748	15.149	$p < .001$
Unweighted Paykel	0.22109	0.13208	0.05468	16.352	$p < .001$
SES x Unweighted Paykel	-0.00515	-0.07662	0.00197	6.850	$p < .01$
Age	0.01578	0.04341	0.01297	1.480	N.S.
Age Squared	-0.00174	-0.08401	0.00061	8.000	$p < .01$
HOS-1970 x Age	0.00734	0.11350	0.00188	15.161	$p < .001$
Race-Black	1.11980	0.08269	0.43855	6.520	$p < .05$
Not Employed-1973	1.35585	0.11210	0.39655	11.690	$p < .001$
(Constant)	1.05822				

Multiple R = 0.77577

R Squared = 0.60182

Adjusted R Squared = 0.59475

Standard Error = 3.80821

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	9	11113.19	1234.80	85.14	$p < .001$
Residual	507	7352.74	14.50		
Total	516	18465.93			

Table 4.9 presents the prediction of unweighted Paykel scores from HOS-1970 scores and the other control terms used previously. Here the overall predictive power of the regression model is enhanced by the higher frequency of less upsetting events within the lower age ranges. This increased prediction is not necessarily desirable, because it comes accompanied by a decreased influence of HOS-1970 scores. Thus, although Hypothesis 3 is confirmed either way, a greater dependence of events on previous symptomatology is observed for the weighted versions of the Paykel index.

Analysis of Individual Items

One logical approach to an analysis of the contribution of differing types of events is the conduct of a stepwise multiple regression analysis based on individual events. This analysis is conducted using all 61 events from the Paykel list as well as the nonevent terms from the previous test of Hypotheses 1 and 2. These latter terms are forced into the equation before stepwise addition of events is initiated. The interactions of events with SES are omitted to maintain feasibility.

Nine life event items enter the equation with $p<.05$ before inclusion is terminated, and provide a coefficient of determination of $R^2=.627$, explaining 62.7% of the variance. The reader should note that the increase in R^2 above

Table 4.9 Regression Analysis of Unweighted Paykel Scores, Using HOS-1970 Scores as a Predictor

Variable	Regression Coefficients: Metric Beta	Regression Coefficients: Standardized Beta	Regression Coefficients: Standard Error Beta	F	Significance
HOS-1970	0.14626	0.23120	0.02672	29.970	$p < .001$
SES-1970	0.01106	0.08505	0.00662	2.797	N.S.
Age	-0.09412	-0.43336	0.00947	98.836	$p < .001$
Age Squared	0.00159	0.12894	0.00052	9.570	$p < .01$
HOS-1970 x Age	-0.00412	-0.10659	0.00154	7.109	$p < .01$
Race-Black	0.62697	0.07750	0.37201	2.840	N.S.
Not Employed-1970	-0.15196	-0.02102	0.31503	0.233	N.S.
(Constant)	9.38014				

Multiple R = 0.47908

R Squared = 0.22952

Adjusted R Squared = 0.21892

Standard Error = 3.15841

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	7	1512.54	216.08	21.66	$p < .001$
Residual	509	5077.55	9.98		
Total	516	6590.09			

the previously described levels is partly due to the culling of the best predictors from 61 original items. Such a post hoc selection may take undue advantage of statistical dependencies within a given sample, and therefore provide an inflated view of the power of the model for other samples.

The nine life events which enter the model are listed in Table 4.10 in order of their entrance. The first three events are "major personal illness," "extramarital affair," and "major financial difficulty." Four of the events in the model are associated with decreases in HOS scores. For three of these, "change in work conditions," "wanted pregnancy," and "child married," the effect observed is consistent with social evaluations of the event as desirable and also with their low values in the Paykel upset ratings.

Although identification of individual events is highly desirable, it has a limited feasibility due to the large number of coefficients which must be estimated, particularly if interaction of events with SES is to be examined. An additional element limiting feasibility is the occurrence of multicollinearity, or even singularity, when the occurrences of several events are concentrated among the same respondents. Thus larger groupings of events must be examined if the hypotheses are to be retested adequately.

Table 4.10 Stepwise Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores Using Individual Events as Predictors

Variable	Regression Coefficients: Metric Beta	Standardized Beta	Standard Error Beta	F	Significance
HOS-1970	0.68663	0.64840	0.03168	469.726	$p < .001$
SES-1973	-0.03018	-0.14373	0.00610	24.472	$p < .001$
Major Personal Illness	2.35964	0.14352	0.46522	25.726	$p < .001$
Extramarital Affair	3.5558]	0.08959	1.08258	10.789	$p < .01$
Major Financial Difficulty	1.62573	0.07968	0.59544	7.454	$p < .01$
Change in Work Conditions	-1.60107	-0.08058	0.56418	8.053	$p < .01$
Argument with Nonresident Family Member	2.59338	0.08368	0.85794	9.137	$p < .01$
Unemployed for 1 Month	1.59004	0.08070	0.56873	7.816	$p < .01$
Increased Arguments with Fiance	-4.96595	-0.06311	2.21515	5.026	$p < .05$
Wanted Pregnancy	-1.96915	-0.5706	0.95811	4.218	$p < .05$
Child Married	-2.60410	-0.05699	1.27310	4.184	$p < .05$
(Constant)	10.14339				

Multiple R = 0.79184

R Squared = 0.62700

Adjusted R Squared = 0.61888

Standard Error = 3.69311

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Square	F	Significance
Regression	11	11578.19	1052.56	77.17	$p < .001$
Residual	505	6887.74	13.64		
Total	516	18465.93			

Entrances and Exits

Hypotheses 1 and 2. The regression analysis presented in Table 4.11 retests Hypotheses 1 and 2 using two measures of life events, entrances to and exits from the social field. Except for the presence of these two event terms and their corresponding interactions with SES, the model is identical to the first regression test of these hypotheses. The coefficient of determination for this model of R^2=.5916, a slight decrease from the original model, is a result of entrance and exit measures using only a portion of the events asked. This use of only selected items also accounts for a lack of significance for the life event and interaction terms. Thus the null hypothesis cannot be rejected for either Hypothesis 1 or 2. Comparison of the two event indices shows that entrances provide almost no contribution to the model, but that exits ($p<.10$) and their cross product with SES ($p<.20$) both make greater contributions to the model than entrances and do so in the form hypothesized.

Hypothesis 3. Examination of Hypothesis 3 using these measures reveals that only exits are predicted by HOS-1970 scores. Within these regression analyses, identical to the initial test of Hypothesis 3 (Table 4.12), exits are predicted by HOS-1970 scores ($p<.01$), although only 5.4% of exit variance is explained by the entire equation. Entrances are not significantly dependent on HOS-1970 scores, although age

Table 4.11 Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores Using Paykel Entrances and Exits as Predictors

Variable	Regression Coefficients: Metric Beta	Regression Coefficients: Standardized Beta	Regression Coefficients: Standard Error Beta	F	Significance
HOS-1970	0.68456	0.64646	0.03246	444.800	p < .001
SES-1973	-0.02362	-0.11246	0.00750	9.916	p < .01
Paykel Exits	0.02137	0.05068	0.01245	2.946	N.S.
Paykel Entrances	-0.00856	-0.00656	0.04042	0.045	N.S.
SES x Exits	-0.00067	-0.04441	0.00043	2.401	N.S.
SES x Entrances	-0.00097	-0.02079	0.00134	0.519	N.S.
Age	-0.00643	-0.01769	0.01284	0.251	N.S.
Age Squared	-0.00147	0.07086	0.00063	5.434	p < .05
HOS-1970 x Age	0.00641	0.09912	0.00190	11.395	p < .001
Race-Black	1.21386	0.08964	0.44472	7.450	p < .01
Not Employed-1973	1.30364	0.10778	0.40365	10.430	p < .01
(Constant)	2.17796				

Multiple R = 0.76916

R Squared = 0.59161

Adjusted R Squared = 0.58271

Standard Error = 3.86437

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	11	10924.59	993.14	66.51	p < .001
Residual	505	7541.34	14.93		
Total	516	18465.93			

Table 4.12 Summary of Regression Analyses Predicting Life Event Scores for Entrances and Exits from HOS-1970 Scores and Sociodemographic Variables

Dependent Variable	Coefficient of Determination (R^2)	Regression Coefficient for HOS-1970		Significance	Other Factors
		Metric Beta	Standardized Beta		
Entrances	0.13400	0.03663	0.04513	N.S.	Age (-), Age-Squared (+)
Exits	0.05448	0.32900	0.13102	$p < .01$	----------

and age squared combine to explain 13.4% of the variance of the entrance measure.

When both analyses using entrances and exits are considered it is clear that exits more nearly approximate the three hypothesized relationships than do entrances. However, even for exits, only the test of Hypothesis 3 reaches the level ($p < .05$) designated for rejection of the null hypothesis.

Symptom Relatedness of Life Events

The symptom relatedness of life events is the focus of Hypothesis 3. This analysis uses three measures to examine which events are most dependent on prior symptomatology, but also uses those same measures to test whether the symptom dependence of events is related to their influence on later symptomatology. These measures correspond to events classified as symptom-related, symptom-independent, or as having an unknown or context dependent relationship to prior symptomatology.

Hypotheses 1 and 2. Table 4.13 presents a regression analysis of HOS-1973 scores as estimated from these three measures and their interactions with SES. Again, the model contains the HOS-1970 scores and the control variables used for the initial test of Hypotheses 1 and 2. The event variable making the greatest contribution is that for events with

Table 4.13 Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores Using Paykel Symptom Relatedness Scores as Predictors

Variable	Regression Coefficients: Metric Beta	Standardized Beta	Standard Error Beta	F	Significance
HOS-1970	0.63726	0.60179	0.03302	372.417	p < .001
SES-1973	-0.03066	-0.14602	0.00746	16.886	p < .001
Paykel-Independent	0.00266	0.00732	0.01092	0.059	N.S.
Paykel-Dependent	0.03496	0.08745	0.01307	7.153	p < .01
Paykel-Unknown	0.03085	0.11779	0.00892	11.964	p < .001
SES x Independent	-0.00009	-0.00698	0.00036	0.059	N.S.
SES x Dependent	-0.00106	-0.06525	0.00052	4.192	p < .05
SES x Unknown	-0.00057	-0.05469	0.00033	2.988	N.S.
HOS-1970 x Age	0.00789	0.12199	0.00189	17.426	p < .001
Age	0.02536	0.06975	0.01327	3.651	N.S.
Age Squared	-0.00188	-0.09060	0.00061	9.336	p < .01
Race-Black	1.13045	0.08348	0.43617	6.717	p < .01
Not Employed-1973	1.43241	0.11843	0.39738	12.994	p < .001
(Constant)	0.52757				

Multiple R = 0.77508

R Squared - 0.60075

Adjusted R Squared = 0.59043

Standard Error = 0.382949

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Squares	F	Significance
Regression	13	11093.34	853.33	58.33	p < .001
Residual	503	7372.59	14.66		
Total	516	18465.93			

unknown or conditional symptom relatedness ($p<.002$). This is followed closely by the symptom-dependent events ($p<.01$). These measures have the form predicted by Hypotheses 1 and 2, although the interaction term for the unknown events fails to reach statistical significance ($p<.10$). The third measure, based on symptom-related events, makes almost no contribution to the overall explanation; this is surprising, given the high average upsettedness ratings of these items.

Hypothesis 3. The test of the true symptom dependence of these three measures (Table 4.14), a test of Hypothesis 3, is consistent with the intent of the classification; the symptom-related measure is predicted strongly by the HOS-1970 scores (metric $\beta=.53040$; $p<.001$) and the symptom-independent measure reveals only a slight dependence on the HOS-1970 scores (metric $\beta=.26440$; $p<.10$). The third measure, those items with unknown or context related dependence on symptoms, and the one most predictive of the HOS-1973 scores, is also the most strongly dependent on the HOS-1970 scores (metric $\beta=.98210$; $p<.001$).

In the above results the hypotheses are supported for the symptom-dependent measure, and, except for the weak interactions, by those events with unknown symptom dependence. The hypotheses are not supported for those events which are least related to symptoms, even though these events have high upset values. This association between predictive

Table 4.14 Summary of Regression Analyses Predicting Life Event Scores Classified by Rated Symptom Dependence from HOS-1970 Scores and Sociodemographic Variables

Dependent Variable	Coefficient of Determination (R^2)	Regression Coefficient for HOS-1970		Significance	Other Factors
		Metric Beta	Standardized Beta		
Symptom-Independent	0.04025	0.26440	0.09082	N.S.	Not Employed (+)
Symptom-Dependent	0.16092	0.63040	0.20022	$p < .01$	Age (-), HOS-1970 x Age (-), SES (-), Age-Sq (+)
Unknown Dependence	0.22617	0.98210	0.24291	$p < .001$	Age (-), Age-Sq (+)

power and symptom dependence is unmistakable, but should be studied further due to the small proportions of variance being explained by even the significant measures.

Areas of Social Activity

The next set of life event measures corresponds to the areas of social activity: education, work, legal-financial, personal health, family-parenting, marital-dating, and other social relationships.

Tests of the hypotheses for these areas provides a means of inferring the types of role and status most susceptible to the effects of previous symptomatology and most likely to influence subsequent symptomatology.

Hypotheses 1 and 2. Table 4.15 presents a regression analysis of the HOS-1973 scores using the model developed above, but with seven measures of life events and their corresponding interactions with SES. The coefficient of determination for this regression is R^2=.62678, a slight increase over the initial model. Examination of regression coefficients for individual measures identifies only four terms making contributions sufficient to reject the null hypothesis. The strongest event term is health,which has a significant linear effect (metric β=.07944; $p<.001$) but no interaction with SES. The term marital-dating provides the next strongest contribution, with a significant linear term (metric β=.04047; $p<.05$) and interaction (metric β=.00178;

Table 4.15 Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores Using Paykel Scores from Life Events Classified by Area of Social Activity as Predictors

Variable	Regression Coefficients: Metric Beta	Standardized Beta	Standard Error Beta	F	Significance
HOS-1970	0.64282	0.60703	0.03255	390.072	$p < .001$
SES-1973	-0.03016	-0.14364	0.00773	15.222	$p < .001$
Education	0.02329	0.01772	0.05270	0.195	N.S.
Work	0.00465	0.00930	0.01671	0.077	N.S.
Legal & Financial	0.01880	0.03894	0.01571	1.432	N.S.
Health	0.07944	0.11703	0.02044	15.104	$p < .001$
Family	-0.01096	-0.02474	0.01314	0.695	N.S.
Marital	0.04047	0.06527	0.01836	4.860	$p < .05$
Other Social	0.03263	0.05268	0.01836	3.158	N.S.
SES x Education	0.00121	0.02183	0.00219	0.306	N.S.
SES x Work	0.00008	0.00409	0.00067	0.016	N.S.
SES x Legal	-0.00152	-0.08288	0.00059	6.561	$p < .05$
SES x Health	0.00069	0.02734	0.00074	0.885	N.S.
SES x Family	-0.00014	-0.00871	0.00046	0.086	N.S.
SES x Marital	-0.00178	-0.07122	0.00075	5.683	$p < .05$
SES x Other	-0.00057	-0.02650	0.00065	0.789	N.S.
Age	0.02229	0.06132	0.01331	2.807	N.S.
Age Squared	-0.00183	-0.08843	0.00063	8.408	$p < .01$
HOS-1970 x Age	0.00722	0.11174	0.00189	14.538	$p < .001$
Race-Black	1.00265	0.07404	0.43628	5.282	$p < .05$
Not Employed-1973	1.00189	0.08284	0.40785	6.035	$p < .05$
(Constant)	1.46621				

Table 4.15 (continued)

Multiple R = 0.79169

R Squared = 0.62678

Adjusted
R Squared = 0.61095

Standard
Error = 3.73134

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Square	F	Significance
Regression	21	11574.09	551.15	39.59	$p < .001$
Residual	495	6891.84	13.92		
Total	516	18465.93			

$p<.05$). Finally, the legal-financial term provides a minimal linear effect (metric $\beta=.01880$; NS) but a much stronger interaction with SES (metric $\beta=-.00152$; $p<.05$). None of the remaining event terms makes significant contribution to the regression. Thus the three areas of events which provide support for Hypotheses 1 or 2 are health, marital-dating, and legal-financial. The nonsignificance of the other measures reflects their lack of marginal contribution after the three significant event measures and the remaining control terms are taken into account.

Hypothesis 3. Table 4.16 summarizes the dependence of the measures for areas of social activity on the HOS-1970 scores and other sociodemographic control variables. Only one of these measures, education, fails to confirm Hypothesis 3; all the other measures reveal small though significant amounts of dependence on the HOS-1970 scores. Additionally, most of the measures are related to age, with more events occurring for younger respondents.

Life Events by Year of Occurrence

The last set of comparisons assesses event contribution by year of occurrence prior to the 1973 interview. The measures identify 12-month periods ending in the year indicated. The purpose of this particular analysis is to determine the influence of the passage of time on the hypothesized relationships.

Table 4.16 Summary of Regression Analyses Predicting Life Event Scores for Areas of Social Activity from HOS-1970 Scores and Sociodemographic Variables

Dependent Variable	Coefficient of Determination (R^2)	Regression Coefficient for HOS-1970		Significance	Other Factors
		Metric Beta	Standardized Beta		
Education	0.14881	0.00676	0.00838	N.S.	Age (-), Age-Sq (+), SES (+)
Work	0.19846	0.40992	0.19339	$p < .001$	Age (-), Not Emp. (-), Age-Sq (+), HOS-1970 x Age (-)
Legal-Financial	0.12121	0.04345	0.16165	$p < .001$	Age (-)
Personal Health	0.06447	0.27900	0.17883	$p < .001$	Age (-), Not Emp. (+)
Family-Parenting	0.02824	0.29484	0.12331	$p < .01$	----------
Marital-Dating	0.06937	0.18862	0.11045	$p < .05$	Age (-)
Other Social Activities	0.7435	0.24327	0.14230	$p < .01$	Age (-), Age-Sq (+)

Hypotheses 1 and 2. This regression analysis of the HOS-1973 scores differs from the original analysis only by substitution of the year-specific event measures and their interactions with SES. This analysis (Table 4.17) has a coefficient of determination of R^2=.60861, almost the same as the original analysis. Within this analysis, the event measures for the first and last years, Paykel-1971 ($p<.01$) and Paykel-1973 ($p<.01$), make significant contributions to the variance explained, but the measure for the middle period, Paykel-1972, makes no contribution. Only Paykel-1973 has a significant interaction with SES ($p<.05$). Thus Hypothesis 1 is confirmed by the 1973 and 1971 Paykel measures and Hypothesis 2 is confirmed only by 1973 Paykel scores.

Hypothesis 3. The dependence of the year specific event measures on the HOS-1970 scores is summarized in Table 4.18. All three years are significantly dependent on the HOS-1970 scores, but the strength of that dependence varies by year. The strongest dependence on the HOS-1970 scores is found for the 1973 events, rather than for the 1971 events. This is contrary to a common sense expectation that temporally proximal measures should be more strongly related. Additionally, each of the measures is found to be significantly dependent on age, with more events occurring for younger respondents.

Table 4.17 Regression Analysis of HOS-1973 Scores as Change from HOS-1970 Scores Using Paykel Scores by Year of Occurrence as Predictors

Variable	Regression Coefficients: Metric Beta	Standardized Beta	Standard Error Beta	F	Significance
HOS-1970	0.65870	0.62204	0.03259	408.459	$p < .001$
SES-1973	-0.05719	-0.27237	0.01580	13.100	$p < .001$
Paykel-1973	0.02577	0.09550	0.00824	9.772	$p < .01$
Paykel-1972	0.01248	0.02894	0.01263	0.976	N.S.
Paykel-1971	0.03701	0.08275	0.01313	7.945	$p < .01$
SES x Paykel-1973	-0.00069	-0.14469	0.00031	4.931	$p < .05$
SES x Paykel-1972	-0.00003	-0.00322	0.00044	0.004	N.S.
SES x Paykel-1971	-0.00064	-0.04332	0.00044	1.896	N.S.
Age	0.01404	0.03862	0.01258	1.246	N.S.
Age Squared	-0.00193	-0.09306	0.00062	9.772	$p < .01$
HOS-1970 x Age	0.00760	0.11756	0.00188	16.357	$p < .001$
Race-Black	1.02104	0.07540	0.43892	5.411	$p < .05$
Not Employed-1973	1.28459	0.10621	0.39567	10.541	$p < .01$
(Constant)	3.87045				

Multiple R = 0.78014

R Squared = 0.60861

Adjusted R Squared = 0.59850

Standard Error = 3.79056

Analysis of Variance

Source	d.f.	Sum of Squares	Mean Square	F	Significance
Regression	13	11238.63	864.51	60.17	$p < .001$
Residual	503	72227.30	14.37		
Total	516	18465.93			

Table 4.18 Summary of Regression Analyses Predicting Life Event Scores by Year from HOS-1970 Scores and Sociodemographic Variables

Dependent Variable	Coefficient of Determination (R^2)	Regression Coefficient for HOS-1970		Significance	Other Factors
		Metric Beta	Standardized Beta		
Paykel-1973	0.13927	0.78763	0.20072	$p < .001$	Age (-), Age-Sq (+), HOS-1970 x Age (-)
Paykel-1972	0.03699	0.24057	0.09795	$p < .05$	Age (-)
Paykel-1971	0.05468	0.28688	0.12117	$p < .01$	Age (-), Age-Sq (+), Black (+)

Discussion

Three hypotheses, developed from the stress literature, have guided the present research.

Hypothesis 1: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the level of life events.

Hypothesis 2: The strength of the association between level of life events and level of psychiatric symptomatology varies inversely with the level of socioeconomic status.

Hypothesis 3: For a specified level of socioeconomic status, the level of psychiatric symptomatology varies directly with the subsequent level of life events.

These hypotheses have been tested, first using weighted Paykel scores as the measure of life events, then using a series of alternative life event measures. The hypotheses are confirmed when life events are defined in terms of weighted or unweighted Paykel scores. They are also confirmed wholly or in part by at least one measure in each of the alternative sets.

In addition to simply testing the hypotheses, the analyses have attempted to provide a degree of quantification to the relationships being tested. This has permitted estimation of the amounts of contribution made by the various measures involved.

This final section of the results chapter attempts to carry these analyses one step further by relating the results obtained to a series of specific issues which have been salient in the current life event literature. Such comparisons should help to pave the way for a new synthesis of the impact of life events on psychiatric symptomatology.

Causes of Psychiatric Symptomatology

The ultimate issue behind studies such as the present one is an uncertainty about the cause or causes of psychiatric symptomatology. Many efforts have been made to ascertain this source of discomfort and debilitation, but no final answers have been obtained. The present study, along with many like it, has attempted to delineate a potential causative factor. The overall result is mixed. The results demonstrate that life events make some contribution to symptomatology but that that contribution must be considered as part of the general context, a tremendous degree of stability in HOS scores observed over the three-year period of the study. We have seen that symptom stability explains 60.7% of HOS score variance while Paykel scores can explain only 8.1% of the overall HOS variance and only 2.1% of the change between 1970 and 1973.

The contributions of life events must also be considered in the light of social class variables which have been demonstrated in previous studies (cf. B. P. and B. S. Dohrenwend, 1969) to be strong associates and even causes of psychiatric disorder. Within this study, SES explains as much as 13.7% of the overall HOS score variance, but no more than 2.7% (1.6% unique) of the HOS score change.

The Study of Change

The second issue, a methodological one, is whether life event studies have been studying within-respondent changes in psychiatric symptomatology, or whether they have been studying across-individual relationships. Only three previous studies have implemented designs using community samples which can directly test for change over time. Haberman (1965) and B. P. and B.S. Dohrenwend (1969) have conducted small studies examining change. Their results, although limited by reduced sample sizes, were similar to those presented here. A third and larger study by Myers et al., (1972, 1974) provides results which are generally similar to ones presented here but which differ in the methodology used for analyzing change. Myers' study compared <u>change</u> in event scores with <u>change</u> in symptom scores. In such an analysis the time factor is effectively cancelled,thus giving results which emphasize short-term rather than long-term change.

The remaining community studies of life events have used cross-sectional designs and thus can report only associations across respondents; but some of these studies have interpreted their results as individual change. Studies of this type provide indirect confirmation of the change in symptom levels only if they can substantiate their implicit assumptions that event scores are not the result of prior symptom levels and are also not the result of a third factor which simultaneously influences symptom level. The present tests of Hypothesis 3 have shown that events may be influenced by symptom levels and, therefore, estimates of the impact of events on symptomatology are likely to be inflated if they are derived from cross-sectional correlations.

Duration of Life Event Effects

A third issue is the expected duration of the effects produced by events. Events may produce long-term effects which accumulate over time, or events may even tend to innoculate the respondent against the recurrence of similar effects. In the former case, the accumulation may appear immediately in the form of a long-term or even permanent increase in symptomatology, or it may produce a bomb waiting to blow if the right triggering event occurs. Brown et al. (1973a, b) have pointed out that events may also trigger disturbances which have been generated by

other factors, even hereditary predispositions. Thus there exist many alternatives to the simple stress model upon which the present research is based. Few of these alternatives can be addressed by a study such as this, and thus the other factors show up either as stability of symptomatology or as unexplained or error variance. Yet, one very specific point can be derived from these considerations. That is the importance of the time interval used in the panel design. The use of a shorter time interval produces measurement of more transient and fewer long-term effects; a longer time interval includes more events with permanent changes. But, the use of an interval which is extremely long may begin to de-emphasize events with effective causations which are long enough to produce extended discomfort and even to result in identification of the respondent as a case of psychiatric disorder.

The results of the present study are confusing with regard to this issue. Events for each of three years have been considered separately. The events occurring within the year before the final survey make only a slightly greater contribution to the explanation than those for the initial one-year period. The events for the middle year, in contrast, make almost no contribution to the variance explained. Whatever the difficulty with the middle period, the contributions of both 1970 and 1973

events suggest that the three years are not too long a period and that some long-term effects of life events are active.

The Influence of SES

A fourth issue is the specific relationship of SES to the influence of life events on psychiatric symptomatology. The present research has delved into the stress literature to produce the view that SES is a measure of resources which enable a respondent to meet the demands imposed by life events. One must acknowledge the crude and global nature of such a formulation, but it predicts a specific and testable hypothesis that there is an interaction effect between events and SES in the production of psychiatric symptomatology. The presence of this interaction is thoroughly confirmed in the above tests of Hypothesis 2.

The strength of the interaction effect observed is sufficient to account for a variation in the influence of events from no effect to twice that of the average. For average values of the control variables and extreme levels of events, this is equivalent to an increase of almost ten HOS points for those with the lowest SES levels and almost no increase for those with high SES levels.

Even though the above formulation is attractive, its alternatives should also be considered. One particular alternative is an initial formulation considered by

B.S. Dohrenwend (1973b) and used by Myers et al. (1974). They considered the possibility that life events, particularly undesirable ones producing great changes, were the result of social class and thus constituted an intervening variable between class and symptomatology. Dohrenwend's analysis led ultimately to an examination of class-specific correlations between event scores and symptom level and resulted in a reversal of position to the position taken in this research, that socioeconomic status reflects resources and thus vulnerability to events. Myers, in contrast, retained the original formulation, arguing that, "the relationship between social class and psychiatric symptoms is a reflection of social class differences in the distribution of Desirability-Change Life events in the community" (Myers et al., 1974:200).

Sources of Life Events

The fifth issue relates to the origins of life events. It asks whether the occurrence of life events is dependent on prior levels of psychiatric symptomatology, socioeconomic status, or any other of the sociodemographic variables. Hypothesis 3 examines the dependence of events on prior levels of psychiatric symptomatology; the hypothesis is confirmed in almost every instance. Although the size of this contribution is uniformly small, it establishes the presence of a reciprocal effect in which events may

influence psychiatric symptomatology which in turn influences events and so forth.

Although not testable without additional waves to this panel design, the reciprocal causation may well be an effect which helps to stabilize symptomatology over time. It may also stabilize the level of occurrence of events. Such stability in the occurrence of events has been observed by B.S. and B.P. Dohrenwend (1972:182) as accident proneness.

Of the other variables contributing to the occurrence of events, age is the most consistent. Younger respondents had higher scores on nearly all of the event measures. This age relationship is often exaggerated beyond a linear effect, as is indicated by the frequent positive age-squared term. An examination of these age differences reveals that many of the events contributing to the high levels for younger respondents are trivial in nature, and thus the older respondents have higher average weights for the events which they did experience. Nonetheless, this increased weight is not sufficient to offset the greater numbers of trivial events.

SES is a significant factor in explaining only two of the event measures; these are the symptom-dependent events and the education-related events. Thus even the undesirable events are not significantly more frequent in the lower class once age and prior symptomatology are controlled.

Alternative Measures of Life Events

The final issue of this discussion is, appropriately, the definition and measurement of life events. In the above research many alternative measures of life events are used in testing the three hypotheses. Each of these measures characterizes at least one dimension of life events which is potentially related to change in psychiatric symptom levels.

Within the above analyses it is seen that weighted Paykel scores are only slightly better at predicting change in HOS scores than the unweighted count of the same items. Rahe (1974) experienced a similar phenomenon with his social readjustment measure, and determined that the lack of difference between weighted and unweighted measures probably reflected low typical levels of extreme events in the lives of typical community respondents. He suggests that the differences would be more marked in a study of patients or other groups which have been selected for high psychopathology.

Additional tests were run using the variety of life event measures available. Those most strongly supporting the hypotheses are those events judged to be symptom dependent, events with unknown or conditional dependence on symptoms, and events occurring within a year of the final survey.

The following additional events support the hypotheses at least partially. They are either incompletely analyzed or else fail to meet the specified level for rejection. These events, consistent with the hypotheses, are best characterized by the high level of demand they place on the respondent. They appear to be largely events in which the person is directly involved, rather than occurrences in an external environment. Personal health is central to these demands. The others heavily involve either primary relationships or activities related to personal failure.

Within the literature reviewed, the life events providing the greatest impact were those events which were high on social readjustment, typical upset produced, or low on social desirability, i.e., loss events (Paykel et al., 1975; B.S. Dohrenwend, 1973a; Myers et al., 1972). These events are generally consistent with such characterizations, but these events also suggest a dimension of responsibility for the event on the part of the respondent. This does not necessarily mean that he had had sufficient control to be the direct cause of the event, as in the formulation of B.S. Dohrenwend (1973b), but rather that on the average he might have been responsible for it or able to prevent it. The issue here is not only the direct

dependence of these events on prior symptomatology or other characteristics of the individual, but whether the social definition of the event is one which is likely to produce social supports for the individual experiencing it. These two effects are not clearly separable in the present study.

Although the above discussion has considered a number of alternative classifications of events, each is based on the same original list of GI items. Clearly, there may be additional events which are as important or even more so for any given respondent than those included. B.P. Dohrenwend has discussed the use of community nominations of events but in general found that many of the nominated events were subjective or objective manifestations of the problems experienced by patient or convict groups. He thus pointed out the need to keep separate three distinct types of events: those confounded with psychiatric disorder, those confounded with physical illness and injury and, finally, those independent of either the subject's physical health or his psychiatric condition. His implication is that the independent events provide the "purest" etiological clue. To the contrary, the conclusion to be made from the present research is that the symptom related and possibly symptom related events are the best predictors, not simply because they are confounded

with psychiatric symptomatology in a definition and measurement sense; but because they make demands on those systems least able to respond. This is seen as a process continuing over time, which is necessarily difficult to analyze.

It seems unlikely that any but the severest of events is likely to occur independently and provide a dramatic long-term change in the level of symptomatology. It is much more likely that a series of events, some independent but some caused by symptomatology, will play back and forth in a process over time making gradual changes in the respondents' symptomatology and general adjustment, and, incidentally, changing the level of resources available to him for meeting the events which do occur. It is in this chronic adaptive and maladaptive set of processes that the desired etiological leads are likely to be found.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Introduction

This chapter begins with an itemization of the major findings of this research. It concludes with a discussion of the implications of those findings for both the theoretical formulation of life event research and its methodological implementation.

Summary of Findings

(1) The primary finding is that only a small proportion of the change in HOS scores can be attributed to life events. The unique contribution of life events in explaining change in symptomatology is only 2.1%. This small size may, however, be deceptive because it applies to the overall sample while we have evidence, above, that the influence of events in some groups will be small, thus diluting the average. The small overall influence of life events is also in contrast to the much larger estimate of the influence of events produced by the cross-sectional analysis, thus suggesting that a substantial proportion of the cross-sectional relationship is due to transient influences of events on symptomatology and to the influence of symptomatology on life events.

(2) The second finding of the present analysis is that the association of life event scores with changes in psychiatric symptomatology over a three-year period is inversely proportional to the socioeconomic status of the respondents involved. This supports Hypothesis 2 above. Life events are more strongly predictive of changes in symptomatology for low SES respondents than for high SES respondents. Because the conditional form of this relationship was suggested by a systems and stress formulation of life event research, some support is given to that theoretical approach. This is particularly true because previous research had failed to develop the interaction hypothesis.

(3) The third finding is that symptom scores are predictive of subsequent life events. Although this is a weak relationship, it suggests a reciprocal influence taking place between life events and symptomatology over time. Such an inter-relationship over time is consistent both with the stability in life event scores over time reported by B.S. and B.P. Dohrenwend (1972) and with the findings below.

(4) Symptom levels are highly similar for most respondents over the three years of the study. More than half of the HOS-1973 score variance is explained by HOS-1970 scores alone. This is a rebuttal to one criticism of the HOS measure, that it taps only transient responses; moreover,

it suggests that models applicable to the long term development of symptomatology should be included in the assessment of the impact of life events.

(5) The analyses of alternative sub-indices of life events support the findings in the literature that various classes of life events provide differing influences on levels of symptomatology. The weighted Paykel index is slightly better at predicting changes in symptomatology than the unweighted index, and the measures for exits, symptom-dependent, symptom-unknown, personal health and marital sub-indices predict better than their alternative measures. Because no single approach has been demonstrated to be substantially better than the remainder, research should continue into discovery of an optimal form of life event measure.

(6) The last finding to be noted here is the strong influence of time in the relationship between life events and symptomatology. This appears first as the importance of recency in the prediction of changes in symptomatology from life events. The more recent events provide a much stronger prediction than do the earlier ones. This suggests that many of the changes in symptomatology produced by life events are transient in nature and do not persist or, alternatively, that the time dimension observed is due to the differential recall of events. When HOS-1970 scores are used to estimate life event scores for each of

the intervening years, it is found that HOS-1970 scores are much more predictive of 1973 events than 1971 events. One explanation for this is that respondents are unable to recall events of the previous years, a finding consistent with the literature. From the present data it is impossible to determine whether the observed effects are due to recency of the event in actual impact or, alternatively, the impact of recall on the reporting of prior events.

Conclusions

Implications for Theoretical Development

Much of life event research has been conducted apart from the theories which could provide both integration to the results and guidance in formulation of methodological strategies. One theme of the present research has been an attempt to integrate stress theory with life event research. The particular fruit of that attempt has been the reformulation of the influence of events as conditional on the respondent's general level of resources, particularly SES. This reformulation is entirely supported by the present data. In terms of the theoretical formulation, this is yet a crude measure of resources. Potential exists for development and incorporation of more specific measures of resources ranging from wealth in the economic sphere, through social supports such as formal organizations and informal supports, through primary and secondary associations, to specific psychological

resources such as knowledge and skills for dealing with the particular demands being posed by the life events.

This comment suggests that new efforts should go into the identification of contextual factors which mediate the influence of events. To a large extent, B.P. Dohrenwend's (1961) mediating factors are equivalent to the resources used in our definition. Thus there should be an increased effort at identification, both theoretically and empirically, of the means by which an individual meets the demands posed by life events. The reformulation which arises must, however, deal with these resources as dynamically interrelated elements which are modified by every successive experience of the individual rather than as fixed attributes. To the extent that such a reformulation is successful, it is also likely to recast the classification of events themselves in terms of this relationship to resources. This is because the events are socially defined both to the individual and to his peers. As labeling theory suggests, the definitions of these events affect the social supports offered.

Some definitions of events may even lead to social disapproval. An anecdote from the present research may illustrate the difference. Two instances of the event, "minor violations of the law," were reported. The first incident related to a minor traffic incident and the second to a hunting violation. In the first incident a man dented the fender of another car while backing out of a parking lot. Although he didn't stop, a boy noted his

license number and reported the incident. The man received a summons and had to go to court to clear up the matter which was dismissed due to the minor nature of the damage. Nonetheless, the man remained angered about having been reported through the time of interview.

The second incident involved a hunter who was caught hunting after sundown, the legal time limit. Although he was fined, he had the pleasure of telling a good tale -- the warden caught him only because the warden had been lost in the woods and needed to be shown the way home!

In these anecdotes, the "fender bender" was upset by the incident more because of public embarrassment than by his technical violation. The hunter, on the other hand, could accept his fine because he was "one up" on the warden. Although one should not attempt to make too much from a pair of isolated incidents, it is clear that the simple classification "minor violation of the law" misses the character of the events in question. Both subjective factors and social definitions of the events vary greatly. It is probable that the reader even finds one of these situations more acceptable than the other. Does this acceptability differ with the audience hearing the anecdotes? If it does, then the point about social definitions is justified!

Implication for Methodology and Future Studies

The implications of the present results for methodology to be used in future studies may be directed at three levels: design, measurement, and analysis.

Design. At the level of design, the present study has shown that recommendations for a longitudinal approach have been correct initially but that they have not gone far enough. The present study has demonstrated a dramatic discrepancy between a cross-sectional approach and one examining change over time. But further refinement is indicated, requiring the inclusion of multiple waves of measurement of both symptomatology and life events. Life events (and, presumably, symptoms) are subject to processes of selective recall and become increasingly unreliable with the passage of time. Thus short intervals of measurement should be used. Yet we have found that symptomatology is highly stable, at least over the three years of the present study. Thus if we wish to study the slower, long-term changes in symptomatology as a cumulative result of events, rather than just the transient influences, the study will have to cover an extended period of time, perhaps ten years or more.

A closely related issue of design is derived from the observation that the influence of life events is much greater for individuals with low SES than it is for

individuals with higher SES. This suggests that studies of the impact of events might differentially focus on groups of individuals without resources in order to obtain maximum efficiency from a study. This is particularly necessary where the dependent variable is a defined pattern of mental disorder rather than general levels of symptomatology as measured by the HOS instrument. If such a study were based on representative samples, the low frequency of occurrence of most mental disorders would produce a very low yield of positive results relative to the number of respondents interviewed. Thus methods of stratified sampling which optimize this yield should be considered. One approach based on the present results would be to focus the study in groups with differentially reduced amounts of resources.

Measurement. The issue of measurement covers all three of the major variables. There are many possible alternative formulations of the life event variable. Some of these would include a reformulation of the item weights, differentials in weight based on recency, and refinement of the life event categories. The use of finer event categories will require the use of probes to determine the exact objective and subjective circumstances of events reported. Where possible, events should be cross-validated with alternative sources of information.

Many of these requirements have been discussed in the literature and need no further elaboration here. One in particular should be considered. That is the relationship of life events to the life cycle (age, relationship, etc.), the importance of which is indicated by the influence of age in both the rates of events and in the changes taking place in symptomatology.

The measurement of symptomatology also needs refinement. Although the HOS appears to be an adequate screening tool, the further specification of the influence of life events will require more precise measures of general levels of symptomatology as well as measures capable of differentiating among sub-classes of mental disturbance. Although we have developed the stress formulation on a general symptom measure, specific relationships between particular events and particular kinds of symptomatology may exist. The differentiation between anxiety and depression producing events might be an initial goal which is justified on the basis of general psychological theory.

The variable SES was used as a general measure of resources available to the individual in meeting the demands placed upon him. Alternative measures of resources should be considered, varying from precise economic resources and wealth through specific social resources.

Analysis. A last comment relates to the need for improved analysis of the data being collected. It was clear in the review of the life event studies that methods of analysis were often applied simply as ad hoc tests of a particular relationship rather than as part of a systematic plan derived from a theoretical model of the relationships among the variables. The use of analyses designed to model effects within a general theoretically defined context will ultimately be more fruitful than ad hoc tests (cf. Simon, 1974). It is likely that such an approach based on efforts to model the relevant relationships will, as a matter of course, lead to appropriate application of multivariate and other advanced techniques.

BIBLIOGRAPHY

Antonovsky, Aaron and R. Kats
1967 "The life crisis history as a tool in epidemiological research." Journal of Health and Social Behavior 8:15-21.

Appley, Mortimer H. and Richard Trumbull
1967 "On the concept of psychological stress." Pp. 1-13 in Mortimer H. Appley and Richard Trumbull (eds.), Psychological Stress: Issues in Research. New York: Appleton-Century-Crofts.

Bell, Roger A., George J. Warheit, and Charles E. Holzer III
1975 "Stressful life events and sociodemographic factors: predictors of psychological disorder." Presented at the annual meeting of the American Psychological Association.

Berkman, Paul L.
1971 "Life stress and psychological well-being: a replication of Langner's analysis in the Midtown Manhattan Study." Journal of Health and Social Behavior 12:35-45.

Birley, J. L. T. and G. W. Brown
1968 "Crisis and life changes and the onset of schizophrenia." Journal of Health and Social Behavior 9:203-215.

Birtchnell, John
1970 "Depression in relation to early and recent parent death." British Journal of Psychiatry 116:299-306.

1972 "The interrelationship between social class, early parent death and mental illness." Psychological Medicine 2:166-175.

Blalock, Hubert M., Jr.
1967 Psychological Stress. New York: Appleton.

1971 Causal Models in the Social Sciences. Chicago: Alden-Atherton.

1972 Social Statistics. New York: McGraw-Hill.

Blau, Peter M. and Otis Dudley Duncan
1967 The American Occupational Structure. New York: Wiley.

Bohrnstedt, George W.
1969 "Observations on the measurement of change." Pp. 113-133 in Edgar F. Borgatta and George W. Bohrnstedt (eds.), Sociological Methodology. San Francisco: Jossey-Bass.

Brown, George W. and J. L. T. Birley
1968 "Crises and life changes and the onset of schizophrenia." Journal of Health and Social Behavior 9:203-214.

Brown, George W., T. O. Harris, and J. Peto
1973a "Life events and psychiatric disorders: Part 2: Nature of causal link." Psychological Medicine 3:159-176.

Brown, George W., F. Sklair, T. O. Harris, and J. L. T. Birley
1973b "Life events and psychiatric disorders: Part 1: Some methodological issues." Psychological Medicine 3:74-87.

Buckley, Walter
1967 Sociology and Modern Systems Theory. Englewood Cliffs: Prentice-Hall.

Cadoret, Remi J., George Winokur, Joe Dorzab, and Max Baker
1972 "Depressive disease: life events and onset of illness." Archives of General Psychiatry 26:133-136.

Campbell, Donald and Julian C. Stanley
1963 Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally.

Cannon, Walter B.
1929 Bodily Changes in Pain, Hunger, Fear and Rage. New York: Appleton-Century-Crofts.

1939 The Wisdom of the Body. New York: W. W. Norton.

Cochrane, Raymond and Alex Robertson
1973 "The life events inventory: a measure of the relative severity of psychosocial stressors." Journal of Psychosomatic Research 17:135-139.

Coddington, R. Dean
1972 "The significance of life events as etiologic factors in the diseases of children: I. A survey of professional workers." Journal of Psychosomatic Research 16:7-18.

Coleman, James S.
1968 "The mathematical study of change." Pp. 428-478 in Hubert M. Blalock, Jr. and Ann Blalock (eds.), Methodology in Social Research. New York: McGraw-Hill.

Cooper, Brian and Judith Sylph
1973 "Life events and the onset of neurotic illness." Psychological Medicine 3:421-435.

Cronbach, Lee J. and Lita Furby
1970 "Can we measure change--or should we?" Psychological Bulletin 69:68-80.

Devereux, Edward C.
1961 "Parsons' sociological theory." Pp. 1-63 in Max Black (ed.), Theories of Talcott Parsons. Englewood Cliffs: Prentice-Hall.

Dohrenwend, Barbara Snell
1970 "Social class and stressful events." Pp. 313-319 in E. H. Hare and J. K. Wing (eds.), Psychiatric Epidemiology: Proceedings of the International Symposium held at Aberdeen University 22-25 July 1969. New York: Oxford.

1973a "Life events as stressors: a methodological inquiry." Journal of Health and Social Behavior 14:167-175.

1973b "Social status and stressful life events." Journal of Personality and Social Psychology 23(2):225-235.

Dohrenwend, Barbara Snell and Bruce P. Dohrenwend.
1970 "Class and race as status-related sources of stress." Pp. 111-140 in Sol Levine and Norman A. Scotch (eds.), Social Stress. Chicago: Aldine.

1972 "Social class and the relation of remote to recent stressors." Pp. 170-185 in Merrill Roff, Lee N. Robins, and Max Pollack (eds.), Life History Research in Psychopathology. Vol II. Minneapolis: University of Minnesota Press.

1974 Stressful Life Events: Their Nature and Effects. New York: Wiley.

Dohrenwend, Bruce P.
1961 "The Social-Psychological nature of stress: a framework of causual inquiry." Journal of Abnormal and Social Psychology 62:294-302.

Dohrenwend, Bruce P.
1969 "Social status, stress and psychological symptoms." The Milbank Memorial Fund Quarterly 47(2):137-150.

1974 "Problems in defining and sampling the relevant population of life events." Pp. 275-310 in Bruce P. Dohrenwend and Barbara S. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

1975 "Sociocultural and social-psychological factors in the genesis of mental disorders." Journal of Health and Social Behavior 16(4):365-392.

Dohrenwend, Bruce P. and Dewitt L. Crandell
1970 "Psychiatric symptoms in community, clinic and mental hospital groups." American Journal of Psychology 126:1611-1621.

Dohrenwend, Bruce P. and Barbara Snell Dohrenwend
1965 "The problem of validity in field studies of psychological disorder." Journal of Abnormal Psychology 70:52-69.

1969 Social Status and Psychological Disorder: A Causal Inquiry. New York: Wiley.

Dohrenwend, B. P., E. T. Chin-Song, G. Egri, F. R. Mendelsohn, and J. Stokes
1970 "Measures of psychiatric disorder in contrasting class and ethnic groups." Pp. 159-202 in E. H. Hare and J. K. Wing (eds.), Psychiatric Epidemiology: Proceedings of the International Symposium held at Aberdeen University 22-25 July 1969. New York: Oxford.

Duncan, Otis Dudley
1975a Introduction to Structural Equation Models. New York: Academic.

1975b "Some linear models for two-wave, two-variable panel analysis with one-way causation and measurement error." Pp. 285-306 in Hubert M. Blalock et al. (eds.), Quantitative Sociology. New York: Academic.

Eastwood, M. R. and M. H. Trevelyan
1972 "Relationship between physical and psychiatric disorder." Psychological Medicine 2:363-372.

Eaton, J. W. and R. J. Weil
1955 Culture and Mental Disorders. Glencoe: Free Press.

Edgerton, J. Wilbert, Willard K. Bentz, and William G. Hollister
1970 "Demographic factors and responses to stress among rural people." American Journal of Public Health 60:1065-1970.

Erikson, Erik H.
1959 "Identity and the life cycle." Psychological Issues Monograph 1(1).

1963 Childhood and Society. New York: Norton.

Farber, B.
1957 "An index of marital integration." Sociometry 20: 117-118.

Festinger, Leon
1975 A Theory of Cognitive Dissonance. Stanford: Stanford University.

Galtung, John
1975 "Diachronic correlation, process analysis and causal analysis." Pp. 3-48 in Hubert M. Blalock et al. (eds.), Quantitative Sociology. New York: Academic.

Gersten, Joanne C., Thomas S. Langner, Jeanne G. Eisenberg, and Lida Orzek
1974 "Child behavior and life events: undesirable change or change per se?" Pp. 159-170 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Gross, Edward
1970 "Work, organization, and stress." Pp. 54-110 in Sol Levine and Norman A. Scotch (eds.), Social Stress. Chicago: Aldine.

Gunderson, E. K. E., R. H. Rahe, and R. J. Arthur
1970 "The epidemiology of illness in naval environments: II. Demographic, social background, and occupational factors." Military Medicine 135:453-458.

Gurin, F., J. Veroff, and S. Feld.
1960 Americans View Their Mental Health. New York: Basic Books.

Haas, J. Eugene and Thomas E. Drabek
1970 "A sociological perspective." Pp. 264-286 in Joseph E. McGrath (ed.), Social and Psychological Factors in Stress. New York: Holt, Rinehart and Winston.

Haberman, P. W.
1965 "An analysis of retest scores for an index of psychophysiological disturbance." Journal of Health and Human Behavior 6:257-260.

Hinkle, Lawrence E.
1974 "The effect of exposure to cultural change, social change, and in interpersonal relationships on health." Pp. 9-44 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Hinkle, Lawrence E. and H. G. Wolff
1958 "Ecologic investigations of the relationship between illness, life experiences and the social environment." Annals of Interval Medicine 49:1375-1388.

Hollingshead, August B. and Frederick C. Redlich
1958 Social Class and Mental Illness. New York: Wiley.

Holmes, Thomas H. and Minoru Masuda
1974 "Life change and illness susceptibility." Pp. 45-72 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Holmes, Thomas H. and Richard H. Rahe
1967 "The social readjustment rating scale." Journal of Psychosomatic Research 11(2):213-218.

Huang, David S.
1970 Regression and Econometric Models. New York: Wiley.

Hudgens, Richard W.
1974 "Personal catastrophe and depression." Pp. 119-134 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Hudgens, Richard W., Eli Robins, and W. Bradford Delong
1970 "The reporting of recent stress in the lives of psychiatric patients: a study of 80 hospitalized patients and 103 informants reporting the presence or absence of specified types of stress." British Journal of Psychiatry 117:635-643.

Jahoda, Marie
1958 Current Concepts of Positive Mental Health. New York: Basic Books.

Janis, Irving L.
1958 Psychological Stress. New York: Wiley.

Kaplan, Howard B.
1975 "Understanding the Social and Social psychological antecedents and consequences of psychopathology." Journal of Health and Social Behavior 16:135-151.

Kauffman, Joseph F.
1976 "Institutions under stress: a review of challenges past, challenges present." Science 192:1224-1225.

Kenney, David A.
1973 "Cross-lagged and synchronous common factors in panel data." Pp. 153-165 in Arthur S. Goldberger and Otis Dudley Duncan (eds.), Structural Equation Models in the Social Sciences. New York: Seminar Press.

Kish, Leslie
1965 Survey Sampling. New York: Wiley.

Klerman, Gerald L. and Eugene S. Paykel
1970 "Depressive pattern, social background, and hospitalization." Journal of Nervous and Mental Disease 150: 466-478.

Kuldau, John M., George J. Warheit, and Charles E. Holzer III
1976 "Health opinion survey validating for needs assessment." Unpublished paper, Department of Psychiatry, University of Florida.

Langner, Thomas S.
1962 "A twenty-two item screening score of psychiatric symptoms indicating impairment." Journal of Health and Human Behavior 3:269-276.

Langner, Thomas S. and S. T. Michael
1963 Life Stress and Mental Health. New York: Free Press.

Lazarus, Richard S.
1966 Psychological Stress and the Coping Process. New York: McGraw-Hill.

1967 "Cognitive and personality factors underlying threat and coping." Pp. 151-169 in Mortimer H. Appley and Richard Trumbull (eds.), Psychological Stress. New York: Appleton-Century-Crofts.

1970 "Cognitive and personality factors underlying threat and coping." Pp. 143-164 in Sol Levine and Norman A. Scotch (eds.), Social Stress. Chicago: Aldine.

Leighton, Dorothea C.
1965 A brief mental health assessment instrument. Unpublished document, Cornell Program in Social Psychiatry.

Leighton, Dorothea C., J. S. Harding, D. B. Macklin, A. M. MacMillan, and A. H. Leighton
1963 The Character of Danger. New York: Basic Books.

Macmillan, Allister M.
1957 "The health opinion survey: Technique for estimating prevalence of psychoneurotic and related types of disorder in communities." Psychological Reports 3:325-329.

Markush, Robert E. and Rachel Favero
1974 "Epidemiologic assessment of stressful life events, depressed mood, and psychophysiological symptoms--a preliminary report." Pp. 171-190 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Masuda, Minoru and Thomas H. Holmes
1967a "Magnitude estimations of social readjustments." Journal of Psychosomatic Research 11:219-225.

1967b "The social readjustment rating scale: A cross-cultural study of Japanese and Americans." Journal of Psychosomatic Research 11:227-237.

1966 Psychological Stress and the Coping Process. New York: McGraw-Hill.

McGrath, Joseph E. (ed.)
1970 Social and Psychological Factors in Stress. New York: Holt, Rinehart and Winston.

Mechanic, David
1962 Students Under Stress. New York: Free Press.

1967 "Invited commentary on self, social environment and stress by A. Pepitone." Pp. 199-202 in Mortimer H. Appley and Richard Trumbull (eds.), Psychological Stress. New York: Appleton-Century-Crofts.

1970 "Some problems in developing a social psychology of adaptation to stress." Pp. 104-123 in Joseph E. McGrath (ed.), Social and Psychological Factors in Stress. New York: Holt, Rinehart and Winston.

Merton, Robert K.
1957 Social Theory and Social Structure. New York: Free Press.

Michaels, R. R., M. J. Huber, and D. S. McCann
1976 "Evaluation of transcendental meditation as a method of reducing stress." Science 192:1242-1246.

Miller, James G.
1969 "Living systems: basic concepts." Pp. 51-134 in William Gray, Frederick J. Duhl, and Nicolas D. Rizzo (eds.), General Systems Theory and Psychiatry. Boston: Little, Brown.

Moss, Gordon E.
1973 Illness, Immunity, and Social Interaction. New York: Wiley.

Myers, Jerome K., Jacob J. Lindenthal, and Max P. Pepper
1971 "Life events and psychiatric impariment." Journal of Nervous and Mental Disease 152:149-157.

1974 "Social class, life events and psychiatric symptoms." Pp. 191-205 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds.), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Myers, Jerome K., Jacob J. Lindenthal, Max P. Pepper, and D. R. Ostrander
1972 "Life events and mental status: a longitudinal study." Journal of Health and Social Behavior 13:398-406.

Nam, Charles B. and Mary Powers
1968 "Changes in the relative status level of workers in the United States 1950-60." Social Forces 47(2): 158-170.

Nam, Charles B., John LaRocque, Mary Powers, and Joan Holmberg
1975 "Occupational status scores: stability and change." American Statistical Association: Proceedings of the Social Statistics Section 570-575.

Parsons, Talcott
1951a The Social System. New York: Free Press.

1951b Toward a General Theory of Action. New York: Harper and Row.

Paykel, Eugene S., Jerome K. Myers, Marcia N. Dienelt, Gerald L. Klerman, Jacob J. Lindenthal, and Max P. Pepper
1969 "Life events and depression: a controlled study." Archives of General Psychiatry 21:753-760.

Paykel, Eugene S., Brigitte A. Prusoff, and Jerome K. Myers
1975 "Suicide attempts in recent life events: a controlled comparison." Archives of General Psychiatry 32:327-333.

Paykel, Eugene S., Brigitte A. Prusoff, and E. H. Uhlenhuth
1971 "Scaling of life events." Archives of General Psychiatry 25:340-347.

Paykel, Eugene S. and E. H. Uhlenhuth
1972 "Rating and magnitude of life stress." Canadian Psychiatric Association Journal 17:93-100.

Pelz, Donald C. and Frank M. Andrews
1964 "Detecting causal priorities in panel study data." American Sociological Review 29:836-848.

Pugh, William M., Jeanne Erickson, Robert T. Rubin, E. K. Eric Gunderson, and Richard H. Rahe
1971 "Cluster analyses of life changes: II. Method and replication in navy subpopulations." Archives of General Psychiatry 25:333.

Rabkin, Judith G. and Elmer L. Struening
1976 "Life events, stress, and illness." Science 194 (4269):1013-1020.

Rahe, Richard H.
1972 "Subjects recent life changes and their near future illness reports." Annals of Clinical Research 4: 250-265.

1974 "The pathway between subjects' recent life changes and their near-future illness reports: representative results and methodological issues." Pp. 73-86 in Barbara S. Dohrenwend and Bruce P. Dohrenwend (eds), Stressful Life Events: Their Nature and Effects. New York: Wiley.

Ricks, David F. and John C. Berry
1970 "Family and symptom patterns that precede schizophrenia." Pp. 31-50 in Merrill Roff and David Ricks (eds.), Life History Research in Psychopathology. Vol. 1. Minneapolis: University of Minnesota.

Ricks, David F., Alexander Thomas, and Merrill Roff
1974 Life History Research in Psychopathology. Vol. III. Minneapolis: University of Minnesota.

Roff, Merrill and David Ricks (eds.)
1970 Life History Research in Psychopathology. Vol. I. Minneapolis: University of Minnesota.

Roff, Merrill, Lee N. Robins, and Max Pollack (eds.)
1972 Life History Research in Psychopathology. Vol. II. Minneapolis: University of Minnesota.

Roth, W. F., Jr. and F. H. Luton
1942 "The mental health program in Tennessee." American Journal of Psychiatry 99:642.

Schwab, John J., Nancy H. McGinnis, and George J. Warheit
1970 "Toward a social psychiatric definition of impairment." British Journal of Social Psychiatry 4(1).

Schwab, John J. and George J. Warheit
1972 "Evaluating southern mental health needs and services." Journal of Florida Medical Association 59 (1):17-20.

Schwab, John J., George J. Warheit, Gary Spencer, and Charles E. Holzer III
1971 "Psychiatric and medical illness." Proceedings of the 3rd International Congress of Social Psychiatry, Zagreb 4:157-165.

Schwartz, Carol C., Jerome K. Myers, and Boris M. Astrachan
1973 "Comparing three measures of mental status." Journal of Health and Social Behavior 14:265-273.

Scott, Robert and Alan Howard
1970 "Models of stress." Pp. 259-278 in Sol Levine and Norman A. Scotch (eds.), Social Stress. Chicago: Aldine.

Seiler, Lauren H.
1973 "The 22-item scale used in field studies of mental illness: a question of melthod, a question of substance, and a question of theory." Journal of Health and Social Behavior 14:252-264.

Selye, Hans
1955 "Stress and disease." Science 122:625-631.

1956 The Stress of Life. New York: McGraw-Hill.

1974 Stress Without Distress. New York: Lippincott.

Selye, Hans and C. Fortier
1950 "Adaptive reactions to stress." Proceedings of the Association for Research in Nervous and Menatl Disorders 29:3.

Silverman, Charlotte
1968 "The epidemiology of depression: a review." American Journal of Psychiatry 124:883-891

Simon, Herbert A.
1974 "How big is a chunk?" Science 183(4124):482-488.

Smith, William G.
1971 "Critical life-events and prevention strategies in mental health." Archives of General Psychiatry 25: 103-109.

Spiro, Herzl R., Iradj Siassi, and Guido M. Crocetti
1972 "Who gets surveyed in a psychiatric survey?" Journal of Nervous and Mental Disease 154(2):105-114.

Srole, Leo, Thomas S. Langner, Stanley T. Michael, Marvin K. Opler, and Thomas A. C. Rennie.
1962 Mental Health in the Metropolis. New York: McGraw-Hill.

Thomas, William I. and Florian Znaniecki
1927 Polish Peasant in Europe and America. Boston: Badger.

Thurlow, H. John
1971 "Illness in relation to life situation and sick-role tendency." Journal of Psychosomatic Research 15:73-88.

Tousignant, Michel, Guy Denis, and Rejean Lachapelle
1974 "Some considerations concerning the validity and use of the health opinion survey." Journal of Health and Social Behavior 15(3):253-260.

Uhlenhuth, E. H. and Eugene S. Paykel
1973a "Symptom configuration and life events." Archives of General Psychiatry 28:744-748.

1973b "Symptom intensity and life events." Archives of General Psychiatry 28:473-477.

U.S. Bureau of the Census
1960 Methodology and Scores of Socioeconomic Status. Working paper.

Vestre, Norris D. and Theodore W. Lorei
1966 "Relationships between social history factors and psychiatric symptoms." Journal of Abnormal Psychology 72(3):247-250.

Vinokur, A. and M. L. Selzer
1975 "Desirable versus undesirable life events--their relationship to stress and mental distress." Journal of Personality and Social Psychology 32: 329-337.

Von Bertalanffy, Ludwig
1969 "General systems theory and psychiatry--an overview." Pp. 33-50 in William Gray, Frederick J. Duhl, and Nicholas D. Rizzo (eds.), General Systems Theory and Psychiatry. Boston: Little, Brown.

Warheit, George J.
1968 The Impact of Community Disasters on the Function Integration of Four American Communities. Ph.D. dissertation, Ohio State University, Columbus, Ohio.

Warheit, George J., Charles E. Holzer III, and Sandra A. Arey
1975a "Mental health in the southeast: an epidemiologic report." Unpublished paper, Department of Psychiatry, University of Florida.

1975b "Race and mental illness: an epidemiologic update." Journal of Health and Social Behavior 16(3):243-256.

Wolff, Harold G.
1953 Stress and Disease. Springfield: Thomas.

BIOGRAPHICAL SKETCH

Charles Elmer Holzer III was born on May 26, 1943, at Cincinnati, Ohio. In June, 1961, he was graduated from Westtown School in Westtown, Pennsylvania. He received the degree of Bachelor of Arts with a major in Psychology from Haverford College at Haverford, Pennsylvania, in 1965. In June, 1973, he received his Master of Arts from the Department of Sociology at the University of Florida. He has been associated with the Department of Psychiatry at the University of Florida since September, 1965.

Mr. Holzer is married to the former Jean Covey Bradford and has a daughter, Robin Ann, and a son, Christopher Paul. He is a member of Alpha Kappa Delta.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

George J. Warheit

George J. Warheit, Chairman
Professor of Sociology and Psychiatry

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Gerald R. Leslie
Professor and Chairman of Sociology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Benjamin L. Gorman
Professor of Sociology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Anthony J. LaGreca
Assistant Professor of Sociology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Alan G. Agresti
Assistant Professor of Statistics

This dissertation was submitted to the Graduate Faculty of the Department of Sociology in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

March 1977

_____

Dean, Graduate School