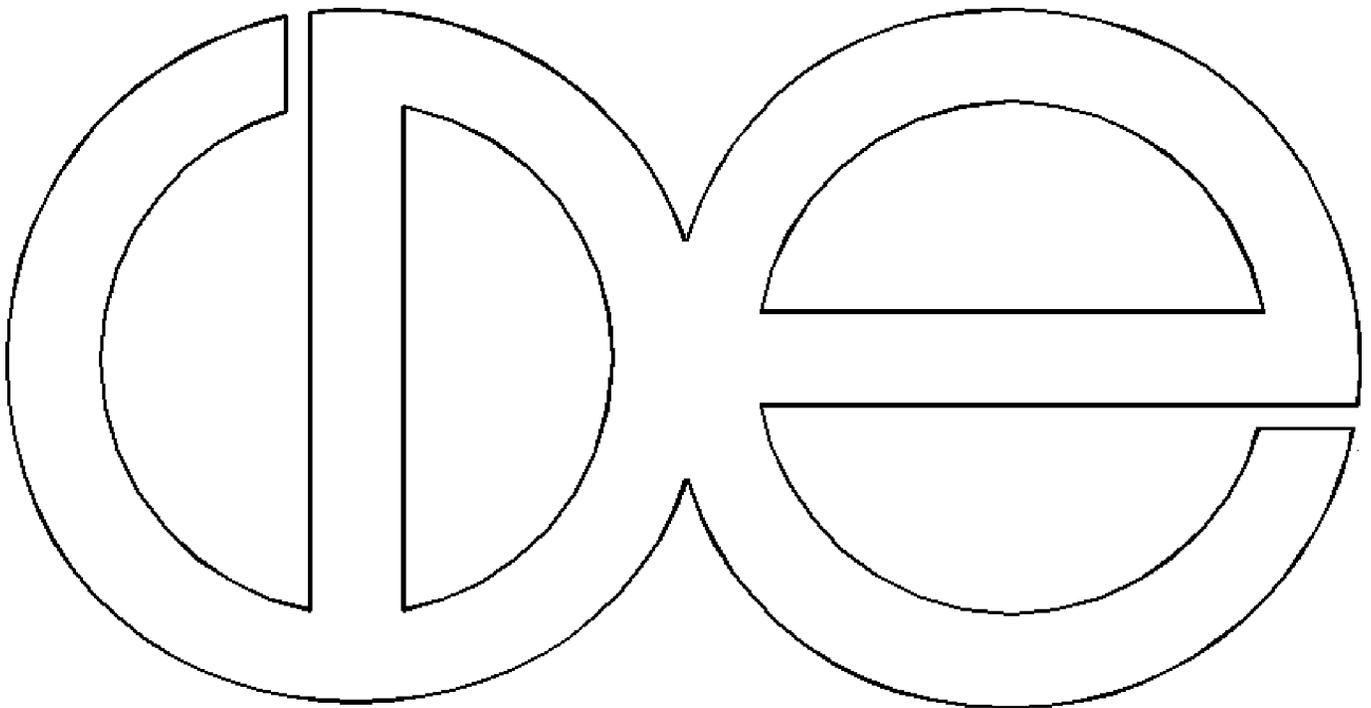


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Life Histories and Mental Health

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LIFE HISTORIES AND MENTAL HEALTH

ABSTRACT

A life history approach to understanding four diverse mental health outcomes is presented. The central aim is to begin with richly detailed, “thick” descriptions of individuals’ lives and from them, to discern generalizable features to account for targeted outcomes. Conceptual principles guiding the organization and interpretation of life history information are summarized. Data from the Wisconsin Longitudinal Study are then used to illustrate the specific methodological steps for analyzing life histories of “resilient” women (those with prior history of depression who report high levels of current well-being). The steps begin with the writing of individual biographies, which are then reviewed for commonalities, and subsequently thinned to more generic descriptions. The process culminates with tests of distinguishability, contrasting the “resilient” from three other mental health groups. Our analysis documents multiple life pathways to resilience, and in so doing, underscores the constructive tension that exists between idiographic and nomothetic as well as inductive and deductive approaches.

Introduction

Life course researchers have long sounded a call for approaches that integrate both individual-level and social structural characteristics, and that examine lives “across time” rather than at isolated age stages. In this paper, we present a methodology for utilizing detailed longitudinal survey data to characterize life histories in sufficiently general terms so that a population of lives is represented while still retaining some of the nuance of individual biographies. In general terms, the analytic strategy is designed to answer the question: how did a given outcome or evolving process come about? The methodology can be viewed as a sequential process of distillation of the essential features of a complex array of intertwined life experiences to explain a selected set of outcomes. A fundamental characteristic of our explanations is that they account for multiple categories of pathways to a given outcome. Thus, the heterogeneity in life experiences that leads to a given outcome (e.g. resilience) is encapsulated in a partitioning of life histories into sub-groups having common, but distinctively organized, categories of experience. These histories are further shown to be qualitatively different from the life histories of those not showing the given outcome.

We illustrate our approach using data from the Wisconsin Longitudinal Study. The specific outcomes here comprise four different mental health groups: those who are depressed, healthy, vulnerable, and resilient. These categories result from the cross-classification of positive and negative indicators of mental health. Although our analysis will focus on the “whole lives” leading up to these four midlife mental health categories, we emphasize throughout that the approach is relevant for examining outcomes as diverse as chronic alcoholism (Vaillant, 1983), productive scientific careers (Zuckerman et al., 1991), downward career mobility (Newman, 1988) and criminal careers (Wolfgang et al., 1972). The essential research question that underlies these and other examples is still: How did a given outcome - whether static in time or an evolving process - result? Answers to this question typically incorporate multiple, intertwined events and individual characteristics which occur across

time and across several life domains. The analytic objective, then, is to identify and distill the essential features of a complex array of factors that explain the outcome variable. Explanations, if they are to have any generality, must involve a small number of clearly defined forces operating at several interrelated levels (e.g., social structural, individual-psychological), and a concise delineation of pathways leading to such outcomes.

The key objectives of this paper, then, are to (1) examine current life course agendas and methodologies; (2) delineate a strategy for developing descriptive explanations for selected outcomes, with these explanations incorporating the cumulative effects of both micro- and macrolevel characteristics; and (3) illustrate our proposed methodology, with the life histories of resilient women in the WLS sample. The cornerstone of our methodology is the development of chronological representations of life histories, which are presented as complex Boolean statements.

Traditions in Life Course Research

Longitudinal studies in sociology and psychology have studied “lives in progress” (White, 1952), primarily along one of two tracks: the individual or the macroscopic (Elder and Caspi, 1990). The first approach, typically adopted by developmental psychologists and psychopathologists, examines case studies of individuals over a long segment of the life-span, or conducts quantitative studies of behavioral continuity and change. This approach “seldom ventures into the larger environment to examine the transformations that take place with it” (Elder and Caspi, 1990). Likewise, in sociological life course research, “the social structural positions of individuals are generally seen to ‘determine’ or ‘shape’ personality or behavior rather mechanistically (and mysteriously). Little attention is paid to the microsocial interpersonal relations and/or psychological processes through which macrosocial structures come to have such effects” (House, 1977).

Substantively, the key questions guiding much of this research deal with issues of continuity and change. On the sociological side, the life course is envisioned as one’s progression through a

series of socially defined, age-linked social roles, including both points of transition and unfolding trajectories. The primary conceptual questions address the social meanings of age (i.e., age-graded expectations and options that influence plans, choices, and actions), and the nexus between individual lives and historical time (i.e., processes of social change that differentiate life patterns of successive cohorts) (Elder, 1994; Hogan, 1981). Empirically, these ideas translate to a wide array of studies, including classic work on the effects of the Great Depression on children's lives (Elder, 1974), the study of men's work lives (Pavalko, Elder and Clipp, 1993), and the timing and sequencing of life events (Hogan, 1981; Marini, 1984, 1987).

Developmental and personality psychologists, in contrast, tend to focus on the continuity and change of personality traits over the life course. Block (1971), for example, uses the Q-sort procedure to assess whether personality traits change or show consistency through time. He emphasizes the "coherence" of personality; that is, it unfolds in generally predictable and consistent ways across time. Caspi (1987) elaborates similar ideas by showing the adult life consequences of undercontrolled, explosive behavior in early life. Other attempts to explain patterns of personality change have involved assessments of particular life experiences and the timing of events (Helson and Wink, 1992).

The literature on developmental psychopathology affords further life history perspectives. Harris, Brown and Bifulco (1990) offer a "biographical model of the developmental pathways" that links parent care in childhood to adult depression in women. Two inter-related strands are proposed to connect the level of care received in childhood to adult depression: (1) an environmental strand made up of parental death or separation from parents, social class in adulthood, social support, pre-marital pregnancy and exposure to stressors (provoking agents), and (2) a cognitive strand made up of coping strategies, helplessness, hopelessness, and depression. Brown et al. (1990) suggest there are a number of different routes along these strands, although distinct patterns of life histories are not enumerated.

By and large, these prior approaches have tended to follow variable-oriented rather than person-oriented strategies (Magnusson and Bergman, 1990) and typically target single life domains (e.g., careers, personality, planful competence), thereby losing the “whole life” focus. Similarly, the long-term consequences of particular events (e.g., the Depression, temper tantrums in childhood, inadequate parental care in childhood), or the timing and sequencing of select events restricted to limited periods of adult life (e.g., completion of education, marriage, beginning of first job) do not address full life histories. Richer, more comprehensive accounts of lives, covering multiple domains and their interconnectedness across lengthy time-spans are largely the purview of single-case studies and in-depth psychobiographical accounts (Runyan, 1983; Vaillant, 1993).

We argue that when the objective is to understand how a given outcome evolved, the process of discovering explanations involves intensive examination of information-rich life histories, and paring these detailed histories into clusters of shared characteristics. The beginning process relies on what Gilbert Ryle (1949) has called “thick description,” a term equated with ethnography by Clifford Geertz (1973) to describe finely nuanced and insightful interpretation of people and the places of their lives. For our purposes, it is the interpretation of individual life histories that is of interest. Our challenge, then is to take multiple “thick descriptions”, and to discern from them the generalizable features that will explain targeted outcomes.

Data Sources and Organizing Principles

While we will employ structured survey data to examine how a particular outcome evolved, we believe that the ideal starting points for ‘thick descriptions’ are ethnographies of individuals, in the form of in-depth and insightfully interpreted biographies. In the study of midlife mental health, for instance, personal narratives and biographies such as novelist William Styron’s (1990) and psychotherapist Martha Manning’s (1995) writings of their own depression, or Kay Redfield Jamison’s (1995) account of her life with manic-depressive illness, provide rich sources of

information.

Large numbers of such detailed biographies are rarely available for the study of a given outcome, however. Alternatively, researchers may turn to extensive focused interviews with supplementary demographic and aggregate-level descriptive information. Exemplars of such data sources include Cole and Singer's (1991) study of gender differences in scientific productivity, based on in-depth interviews with 125 members of the National Academy of Science, and Newman's (1988) in-depth interviews with 150 downwardly mobile workers in the New York area during the mid 1980s.

Large longitudinal surveys with fine-grained information for each sample member provide a further source of data for this type of analysis. Although analysis may begin with the full array of characteristics per individual, researchers will, after careful scrutiny, whittle this list of variables down to a manageable number of theoretically-relevant predictor characteristics. In the process, there is an inevitable tension between the necessity of thinning the "thick descriptions" down for generalization purposes and at the same time retaining the maximal number of key descriptive features. It is these relatively "thin" clusters of generalizable features that are necessary to conduct subsequent statistical tests of the uniqueness of particular life histories associated with specific outcomes.

This process of "thinning" thick descriptions into clusters of essential characteristics must be guided by a set of principles that inform the researcher which clusters of characteristics are most essential to explain the outcome of interest. For a variety of mental health outcomes (e.g., depression, chronic alcoholism, resilience, positive well-being, etc.), we propose principles to organize and interpret generic features of life histories implicated in the outcomes of interest. These principles, stated in terms of their hypothesized effects on mental health, are described below:

(1) *Adversity and its cumulation over time has negative mental health consequences.* The idea that negative events and difficult life conditions contribute to mental disorders has longstanding

presence in mental health research. We subscribe to this view, but give particular emphasis to the cumulation of adverse experiences across life domains through time. Cole and Singer's (1991) limited difference theory emphasized that individuals are exposed to events of many types over their lives. Over short time intervals, these single provoking events and reactions to them produce small, or limited, differences on outcome measures. Over the life course, however, it is the cumulative effect of these small differences that are hypothesized to produce substantial differences in outcomes - analogous to a "multiplier effect" - defined here in terms of positive and negative mental health.

(2) *Advantage and its cumulation over time has positive mental health consequences.*

Because we are interested in understanding positive as well as negative features of mental health, our life history analyses give emphasis to positive aspects of respondents' lives. These may come in the form of starting resources (e.g., growing up in an intact family), personal capacities and abilities (e.g., IQ), the realization of expected life transitions (e.g., job promotions, marriage), and having positive evaluations of one's life (e.g., job satisfaction, high marital quality). While adversity is predicted to compromise mental health, we hypothesize that experiences of advantage have ameliorative and "buffering" consequences.

(3) *Reactions to adversity or advantage influence the impact of life experiences.* Consistent with the extensive prior research on coping responses to stressful life events and with the Cole and Singer (1991) emphasis on reactions to events, we underscore the importance of how life experience is cognitively construed. However, because our life histories include not only unexpected life events, but also chronic conditions, normative life transitions and general life evaluations, we broaden the scope of what is typically examined under the rubric of reactions.

(4) *Position in social hierarchies has consequences for mental health.* House (1977) asserts that one's position in a hierarchy - be it family, occupation or age - has pervasive effects on a broad range of outcomes. We endorse this view and conceptualize "position in social hierarchy" as a

broader construct than simply one's education, income, and occupational status. Although social class constitutes a prominent dimension of hierarchy in the human species, individuals are also differentiated according to hierarchies of abilities (e.g., IQ, grades), positions of power and influence in their families and communities, and degrees of autonomy and authority in the workplace. (For a useful historical review of health differentials as a function of social class, see Sorokin (1927, Ch. 11). Evolutionary psychology shows that social hierarchies have been ubiquitous features of human and animal life over vast expanses of time (Weisfeld et al., 1980; Wright, 1994). Thus, we seek to broaden the conception of social stratification to include hierarchies that pervade everyday life. Accordingly, we hypothesize that negative mental health results from the cumulative effects of low social standing across diverse domains, and alternatively, that high social standing and its cumulation over time has positive mental health consequences.¹

Following the "social structure and personality" tradition in sociology (House, 1977), our assessment of social hierarchies includes both structural and psychological aspects. The former emphasize position within the social group, indexed conventionally by the socioeconomic position of one's family of origin (e.g., parents' education), personal educational and occupational attainments, and income. To these, we add statuses with regard to ability (e.g. IQ), levels of supervision and authority at work, and high levels of participation in civic and community activities. The psychological features of social hierarchies are explored via social comparison processes in which respondents compare certain aspects of their life achievements with relevant others.

(5) Social relationships influence the impact of life experiences and enduring conditions.

This principle converges with the vast literature on social supports and their ameliorative effects on responses to life stress (Wheaton, 1985; Wethington and Kessler, 1986). Following this tradition, we

¹ An exception to this can arise in unstable hierarchies where persons at the top are under constant threat while those below the top are more secure, or at least, less threatened (Sapolsky, 1994).

consider the buffering effects of quality relationships on difficult life experiences, but in addition, seek to explicate the role of significant others in contributing to one's sense of positive self-regard, involving feelings of esteem and worth. The latter ideas carry our interest in social hierarchies to the level of primary social relationships and how they provide subjective experiences of high versus low social standing. In related fashion, we will examine balance in the extent to which individuals get from and give time, money, and care to others -- those who receive more than they give may also experience lower standing relative to others. Finally, we examine social relationships as sources of significant and enduring emotional experiences. It is the combination of these various aspects of social relationships and their cumulation over time that is thought to enhance or diminish mental (and ultimately physical) health statuses. Although we will be using these five guiding principles to explain mental health outcomes among members of the Wisconsin Longitudinal Study, these broad principles may be used to organize hypotheses about a diverse set of mental health outcomes, and may be used to interpret a variety of sources of data.

We will briefly return to two examples mentioned earlier - Styron (1990) and Cole and Singer (1991) - to illustrate the wide applicability of this approach.² Although Styron's biography provides a detailed account of his pathway to depression and subsequent recovery - a form of resilience - we can break down his "thick" life description into experiences of adversity (death of mother and hospitalization of depressed father during childhood); advantage (long and successful writing career); reactions to adversity and advantage (40-year history of alcoholism, Halcion addiction); position in social hierarchies (first novel won Prix de Rome of American Academy of Arts & Letters, awarded Pulitzer Prize); and social relationships (long-term marriage, close friendships with other writers and

² One tactic for distilling characteristics and testing for distinguishability while analyzing qualitative data is to use a text retrieval system such as GATOR (Giordano, Cole, & Zuckerman, 1988). Text retrieval programs are capable of functions including: isolating blocks of interview text, indexing the blocks, ordering them into groups, identifying subjects quantitatively, conducting combinatory searches and treating overlapping morphologies.

artists). This forms the basis of an explanation for the resilient outcome.

Likewise, it is possible to develop hypotheses, in accordance with these five guiding principles, about gender differences in scientific productivity by reexamination of the Cole and Singer (1991) analysis. Gender differences in productivity can be conceptualized as the outcome of: experiences of adversity (rejections of manuscripts and grant proposals, divorces, family deaths); advantage (academic success over the life course, admission to top graduate program, high-profile mentor); reactions to adversity and advantage (periods of low productivity following professional rejections); position in social hierarchies (gaining tenure, holding leadership positions in professional organizations); and social relationships (supportive colleagues and family members, mentoring relationships). Male scientists surpass female scientists as a result of their more frequent positive reactions to negative events (e.g. minimal discouragement in the face of grant rejections), thereby maintaining high productivity in the face of adversity.

Methodological Details:

An Illustration using the Wisconsin Longitudinal Study

We will now illustrate a general methodology for distilling “whole lives” into clusters of generalizable traits summarized by complex Boolean statements, and how it is possible to test statistically whether such descriptions can differentiate membership in different outcome categories.

Data

The empirical analysis here will use data from the Wisconsin Longitudinal Study, a long-term study of a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957. Survey data were collected from the original respondents in 1957, 1975 and 1992/1993. Telephone interviews were conducted during 1992/1993 with 8020 of the 1975 respondents, 6535

of whom also responded to a mail survey.³ Data have been collected on respondents' family backgrounds, starting resources, academic abilities, youthful aspirations, adult educational and occupational achievements, work events and conditions, family events, social support, social comparison processes, and physical and mental health. The analyses in this paper will focus on the 5009 primary respondents who participated in all three waves of the WLS and who responded to questions assessing affective disorder and well-being in the most recent survey.⁴

Although the WLS sample is limited to persons who were in their senior year in high school in 1957, the data are uniquely appropriate for the investigation of life course issues. It is the only longitudinal data set containing extensive information data about the social backgrounds, aspirations and detailed work experiences of a large sample of American men and women in their mid 50s. Information on educational, marital, and job transitions, as well as on when children were born/adopted and died, is nearly comprehensive. These survey data are supplemented by earnings reports of parents from state tax records, mental ability tests and measures of school performance from school records, and characteristics of employers and industries. The study has been a forum for the development of comprehensive social psychological models to explain socioeconomic achievement from adolescence to midlife.

Although the Wisconsin Longitudinal Study was originally formulated as a study of educational and occupational aspirations and attainments over the life course, we have borrowed Elder's strategy of "recasting" the data to answer our own set of substantive questions. Elder and

³ The WLS is unique in its high rate of retention . In 1992-93, the WLS located 10,031 (97.2%) of the original 1957 sample of 10,317 graduates, either dead (N=576; 5.6%) or alive (9,455; 91.6%). In 1992-93, telephone interviews were completed with 89.9% of the living respondents (N=8,493); twenty-page mailback surveys were received from 82.3% of telephone respondents (N=6,877) (Hauser et al., 1993; Marks and Shinberg, 1996).

⁴ The affective disorder questions were administered to a randomly-selected 80% of respondents. If every respondent were to be administered every subseries of questions (e.g. contact and closeness with parents and children, occupational characteristics, etc.), the interview would have run much longer than one hour (Hauser et al., 1993).

colleagues (1993) describe recasting as “the interactive dynamic between research question and archival data. . . . During a research project, initial questions are reformulated to fit the data and the data are reworked in coding and recoding to fit the question better.” A close examination of all variables available in the WLS allowed us to select a cluster of variables that we believe to be integral to the study of adult mental health. A list of relevant data within each of the relevant domains is presented in Table 1. The central question raised herein is how to use this full array of information. This issue confronts investigators who work with any complex data set, longitudinal or otherwise.

[Table 1 about here]

Selecting Outcome Variables

We propose a four-category typology of mental health, based on assessments of both depression and multiple aspects of psychological well-being. Our aim is to understand the life histories which characterize the four different mental health groups: Depressed/unwell; healthy; vulnerable and resilient. These categories result from the cross-classification of positive and negative mental health indicators. Our typological approach addresses the imbalance in prior mental health research, where health is routinely defined as the absence of illness rather than the presence of wellness (Ryff and Singer, 1996), and it points to neglected categories of psychological functioning -- namely, the vulnerable and the resilient. Moreover, a typological approach underscores our objective of moving away from a variable-centered analysis (focusing on differences among individuals on a single variable) to a person-centered analysis, which allows us to focus on interacting components of variables within individuals (York and John, 1992).

The defining characteristics of the four mental health groups are: Depressed/Unwell -- those with prior episode(s) of serious depression who also lack high psychological well-being at midlife; Healthy -- those with high levels of well-being at midlife and no history of depression; Vulnerable -- those with no history of depression but who have low levels of psychological well-being at midlife;

Resilient -- those with prior history of depression but who report high levels of current well-being.⁵

Although we refer to these as mental health “outcomes,” we see mental health as part of the unfolding life story. Feedback systems are thus inevitably operative between mental health profiles and the events, experiences, and conditions that comprise individual lives. Tracking such processes requires repeated assessments of mental health through time, a limitation of the current WLS data set.

Analysis

Our analytical strategy involves five major steps: (1) Construct both text and tabular biographies for a subsample of cases from each of four mental health groups; (2) Identify “commonalities” among the life histories within each mental health category; (3) Create a series of response vectors which characterize the traits and experiences of each of the four mental health groups; (4) Summarize and interpret abstracted admissible chronological representations (AACRS), using the tension between individual lives and subgroup variation; (5) Conduct global tests of distinguishability to assess whether life history features of particular groups (e.g., the resilient, or subgroups within them) are distinct from the remaining mental health groups.

This approach represents an attempt to integrate the early idiographic approach used by Allport (1937) in his studies of personality, with the more widely-used nomothetic approach adopted by many sociologists. It also has much in common with methodology in historical sociology as

⁵ Depression was assessed in the telephone interview by a subset of questions from the Composite International Diagnostic Interview (CIDI) (Wittchen et al., 1991) measure of Major Depression (MDE) as defined in the DSM-III-R (APA, 1987). Respondents who reported any episode of depressed affect and who experienced three or more of a series of seven symptoms during the two weeks prior to interview were classified as “ever depressed”.

Psychological well-being was assessed using Ryff’s scale (Ryff, 1995; Ryff and Keyes, 1995) which measured the six dimensions of autonomy, environmental mastery, personal growth, purpose in life, positive relations with others, and self-acceptance. These dimensions were operationalized with structured, self-report six-point Likert scales. The scale construction process is detailed in Ryff (1989). High well-being is operationalized as agreeing or strongly agreeing with six or more of the seven items on each of the six well-being scales. Low well-being is defined as strongly disagreeing, disagreeing, or neither agreeing or disagreeing with five or more of the seven items on each of the six well-being scales. “Agreement” indicates agreement with positively-worded items. Negatively-worded items were recoded before conducting the mental health classifications.

exemplified by the strategies of Tilly (1984) (See Hunt 1984, p. 257), Moore (Smith, 1984. pp. 316-317) and Bloch (1928) (See Sewell, 1967). Although the idiographic approach of examining individual biographies allows for in-depth understanding of particular individuals, it prompts pointed criticisms, including lack of generalizability; reliance on arbitrary or subjective interpretations of individual cases (Runyan, 1983); and an emphasis on describing particular cases rather than generating and testing general hypotheses about human behavior (Nunnally, 1978). Staub (1980, p. 3) noted that “if we focus on the uniqueness of every human being, we cannot generalize from one person to another. Since the aim of science is to discover laws or principles - applicable to at least some, if not to all people - what we will learn will not contribute to [science].” It is for these reasons that we propose a process of hypothesis development and testing that involves a series of movements back and forth between the idiographic and the nomothetic levels. Hypotheses about the particular types of adversity, advantage, reactions, social positions and social relationships characterizing particular mental health groups are continually refined as we refer back to our biographies, past empirical and theoretical literature on mental health, and preliminary descriptive statistics from the WLS data.

(Step 1) Write individual case histories for randomly selected respondents from each of the four mental health categories.

We randomly selected three to six respondents from each of the four mental health groups and constructed a highly detailed “biography” for each individual. For each randomly selected case, the entire person data record is amassed; that is, the subject’s responses to each and every question asked on the 1957, 1975, and 1992 surveys. Biographies were created using responses on more than 100 variables spanning the 1957, 1975, and 1992-92 interviews, as well as open-ended comments made by the interviewer and respondent throughout each of the interviews. The variables selected for inclusion in the biographies were those expected to impact adult mental health, based on prior

theoretical and empirical works. Additionally, our goal was to tell the life story in such a way that the omitted information makes little or no difference in understanding the main structure and ordering of relevant life events that preceded and predict midlife mental health outcomes (Bromley, 1986). In each case, the biography included full information on the respondent's parental socioeconomic resources, the respondent's IQ and high school class rank, a detailed history of work experience and educational attainment, marital status, dates of marriages, divorces and deaths in the family, number of children, quality of interpersonal relationships, and physical health, including drinking and smoking behavior (See Exhibit A).

Each of the four members of the research team carefully scrutinized these biographies and attempted to find commonalities and variation between the lives of those sharing like mental health profiles. This "case study" step was essential in describing and helping to formulate hypotheses about the type, timing and number of events, as well as the sociodemographic characteristics which are associated with each proposed mental health "type." This step also allowed focus on detailed lives of unique individuals rather than an aggregate "statistical portrait" of each mental health type. Each biography essentially told a story of how the individual's life unfolded across time, and thereby helped in the formulation of hypotheses about how work, family and background, organized according to the guiding conceptual principles, impact midlife mental health.

This process represents a distillation of the essential ingredients of life experience that, for the particular individual, can explain how that person reached the outcome in question. The biographies include implicit logical "AND" statements involving four or five conditions that, working together, are critical in characterizing the life history. Biographies are presented here in both prose and tabular chronological form. An example of a biography for a resilient woman is provided below, while the

chronological representation is shown in Table 2.⁶ Table 2 is not a complete record of all the data contained in the biography. Rather it is a first step in the movement from idiographic to nomothetic theory development and testing. We broke down the biography into several “chunks” of variables, in accordance with our guiding principles. Indicators of “adversity” include co-residence with a problem drinker and early family deaths. “Advantage,” alternatively, comprises characteristics such as religiosity (Ellison, 1991) and career advancement.

[Table 2 about here]

Exhibit A: Biography of Resilient Woman

The respondent is one of nine children; she has two older brothers, two younger brothers and four younger sisters. When she was in high school, her father, who had six years of schooling, worked as a repair man for a public utility. Her mother had eight years of schooling and did not work when the respondent was in high school. The family was of German Catholic descent, and attended church once a week when the respondent was in high school. They lived in a large city (Milwaukee, pop: 150,000).

In her senior year in high school, she did not plan to go to college, and said that her parents did not care whether or not she attended. She planned to get a typing job in an office, and noted that most of her friends were also planning on getting jobs after graduation. Still, she did quite well in high school; her grades placed her at the 79th percentile and her IQ was 112. She also noted that marriage prospects influenced her post-high school plans; she married two years after graduation.

The month after high school graduation, she took a job as a clerical worker at an insurance company. She did not take any formal business or apprenticeship training courses, yet participated in a formal on-the-job training program in 1965. In 1975, she was working full-time at the same job that she began in July 1957; a clerical worker at a large insurance firm which employed roughly 700 people. In 1975, she reported that her job involved mental rather than physical tasks; She said that she always worked under the pressure of time, and was required to think and move quickly, yet she did not have the pressures of heavy physical work, nor overtime work.

Her job as an insurance clerk offered little opportunity for autonomy or authority, however; she sometimes felt she was held responsible for things outside her control, and did not have the authority to hire or fire others, set rates of pay, or to supervise the work of others. Rather, someone else supervised what she did and how she did it.

In 1975 she was satisfied with her work hours, job security, fringe benefits, supervisor, and pay, but was less satisfied with how interesting the work was, how highly others regarded her job, and the chance to use her abilities. She was “very dissatisfied” with her chance to get ahead - a job attribute she deemed “very important.” Overall, she was “somewhat dissatisfied” with her job, and hoped to hold a supervisory job at an insurance firm ten years in the future.

Between 1957 and 1975, her personal life was marked by the same continuity as her work life. She married in 1959, and in 1975 was still married. Her husband, the son of a plumber, worked

⁶ To protect the anonymity of the WLS respondents, this biography represents a composite of the life events and characteristics of several resilient women.

as a financial manager. The couple had three children, born in 1960, 1961 and 1969. Her father died at about the same time that she gave birth to her youngest child.

She continued to work during her child rearing years, and was promoted to the position of clerical supervisor in the years between her second and third births. She maintained a fairly active social life, and was involved in the PTA in 1975 and was very involved in the church in both 1975 and 1992. Also she reports that in the month prior to the 1975 interview, she got together with friends roughly 10 times.

In her late 30s through early 40s, however, a series of stressful events occurred. In 1977, her older brother died of cancer at age 47. In 1980, her mother died, and our respondent's first spell of depression occurred. Her worst period of depression occurred at age 40. Shortly thereafter, at age 43 she got a divorce, and at 45 she left her job.

She held a series of supervisory and upper level secretarial jobs in the insurance industry over the next 10 years. In 1985 she took an administrative secretarial job at an insurance firm, where she still worked in 1992. She is "very satisfied" with her job, and she receives both health insurance and a pension. Most coworkers at her job level are high school graduates. Moreover, she perceives a 0 (zero) percent chance that she will lose her job over the next two years.

Five years after her 1983 divorce, however, she remarried and in 1992 she was still in this second marriage. At the time of the 1992 interview, the respondent reported that she and her husband were "very close" and that the two share a "very similar" outlook on life. Her husband, a laborer for a construction company, is five years younger than she is and was once before married.

At age 53, this respondent appears happy in both personal and professional realms of life, as evidenced by her high psychological well-being scores. Her physical health is "excellent", and her health and appearance are "just as good" as they were 10 years ago. Although she exercises several times a month, she does have a history of smoking and has lived with a problem drinker. She reported that she lived with a problem drinker during the first 18 years of life, and then again as an adult.

This respondent is classified as "resilient" due to her past depression and high psychological well-being. At age 53, she is quite satisfied with her achievements in life. She rates education, financial status, and work as very important, and believes that she has been "somewhat successful" in the first two domains, and "very successful" in the latter.

Compared to significant others, this respondent is also satisfied with her life achievements. When asked to compare herself to her mother at age 50, the respondent claimed to be doing better in terms of education and work, and doing much better financially. When asked to compare herself, at age 30, to her 30-year-old daughter today, she said that her daughter has done better in terms of education and much better financially, although the two have done equally well in terms of work. Our respondent and her younger sister have done equally well in terms of work and education, although her sister has done "much better" in terms of finances.

Reading the text biographies also allowed us to identify respondents' reactions to advantage and adversity; "reactions" include career aspirations, self-assessments of success, indicators of job satisfaction, and remarriage. The chronological representation of biography also allowed us to track the respondents' movements within social hierarchies throughout the life course; position in

hierarchies were defined in terms of high school class rank, parents' socioeconomic status, occupational status, and participation in social and community organizations.

(Step 2) Search for commonalities and variation within each mental health group.

Although the individual biographies provided detailed descriptions of the life histories characterizing each mental group, four or five cases per category is not a sufficient sample for hypothesis generation. Therefore, we randomly selected an additional 10 cases from each of the four mental health groups and created a computer printout listing outcomes for each respondent on roughly 100 selected variables drawn from the 1957, 1975 and 1992 surveys. Within each mental health category, we again searched for a series or cluster of "commonalities," or shared events and traits which characterized the lives of each mental health type. It was this iterative process of referring to both detailed biographies and printouts that allowed us to generate specific hypotheses. The four researchers had frequent meetings where each of the case records was discussed; the discussions and cooperative process ensured that a "multiple lens" was used in developing hypotheses and selecting relevant variables.

Although this step involved a relatively small sample size, some within-group commonalities were readily apparent. For instance, a close reading of our data on the 10 randomly selected cases of Depressed/Unwell respondents (7 female, 3 male) revealed that none of the seven women had attended college. Not one of the ten had a parent who graduated high school. Eight of the ten respondents had two children born within one year of each other, and four of the seven women admitted that at least one child was unwanted. Two of the three men admitted that their drinking had caused trouble for them at home or at work. In contrast, however, half of the Healthy sample reported that both of their parents graduated college, and each of the three healthy male respondents and half of the healthy female respondents earned a Bachelor's degree by age 24. Not one member of this small sample of Healthy respondents reported that drinking had ever caused a problem at home

or at work. Three of the married respondents had no children, while the remaining respondents waited at least two years after marrying to have a child.

Based on our observations in this step, we developed coarse statements that summarized the essential elements comprising the life histories of each of the four groups, and created an “initial generic life history” (IGLH). An example of the abstracted hypotheses we developed are depicted in Table 3. The characteristics listed in Table 3 are those which, following the process of reading biographies and examining individual case records, emerged as the “commonalities” within the group of resilient women. The IGLHs give an initial indication of the variability in life history detail that will ultimately be part of a description of a “class” of histories that are purported to explain an outcome. A central ingredient of the IGLHs are Boolean statements such as “the person must have at least four of the following five conditions...” Each set of four conditions, then, is expressed as a logical “AND” statement derived from several biographies. As Table 3 shows, a characterization of resilient women is expected to include four out of the following five conditions: (i) very close to spouse; (ii) persistent participation in a church group; (iii) regular participation in a civic organization; and (iv) at least one close confidante, including a family member, non-related friends or child(ren); (v) numerous visits with friends over many years.

[Table 3 about here]

This Boolean statement involves long-term circumstances that may facilitate recovery from episodes of severe depression. Multiple Boolean statements and individual response conditions operationalize the IGLH which can be summarized in an abstracted chronological chart (see Table 3) or equivalently, vectors β with many fewer components than the raw response vectors utilized to generate biographies but still requiring further distillation to define a more parsimonious representation of a class of explanatory histories.

(Step 3) Response vectors, based on the “shared” variables, are generated for all persons in the given mental health group.

The next step involves the generation of response vectors based on the variables in vector β , and organized in blocks identified by the principal features of our explanatory framework. In the context of mental health outcomes, these are (i) cumulation of adversity; (ii) cumulation of advantage; (iii) reactions to adversity and advantage; (iv) social orderings; and (v) quality of social relationships. An informed theory of mental health, however, is essential here for the blocking of variables and the ultimate interpretation of the class of parsimonious histories that are viewed as explanations for a defined outcome.

The following step involves the sequential examination of 50 response vectors at a time, looking for co-occurring conditions and cross-age linkages, based on the central organizing theoretical principles. After the first 50 cases are examined, the result is a proposed vector of variables $\alpha=(\alpha_1, \dots, \alpha_n)$ that will define the ultimate class of admissible chronological representations (AACRs) that correspond to an explanation for a prescribed outcome. The life history of a single individual is now a logical “AND” statement involving a response on each of the N variables in the vector α (see Appendix A for example). It is important to note that entries in α are often Boolean statements based on the elements of β . The formation of these theory-guided Boolean statements is central to our distillation process and represents a step that is beyond the capability of extant exploratory data analytic software. Indeed, an important methodological research problem is to design interactive software that can lead to more efficient production of interpretable Boolean components of α .

With an initial proposed class of α vectors at hand, a second set of 50 β -vectors is examined to test the original proposal for stability and to refine it. Continuing in this fashion through the full population of persons who have a given outcome to be explained - e.g., psychological resilience -

leads to a final family of vectors α , that define the AACR that will be viewed as “explanation.”

(Step 4) Summarize and interpret AACRS, using the tension between individual lives and subgroup variation.

For the two final steps in our methodological sequence, we focus the discussion on the life histories of a particular group (i.e., resilient women) to clarify the meaning of the analysis and provide a substantive illustration. We emphasize, however, that the same generic progression of analytic steps applies to the three remaining subgroups in our typology (i.e., depressed, vulnerable, and healthy).

Step 3 for resilient women resulted in the identification of 17 components of AACRs that, following from our guiding principles, comprise the central co-occurring conditions and cross-age linkages for resilient women. These 17 components are summarized in Table 4. Although these components represent a dramatic reduction from the approximately 250 variables with which the analysis began, we note that individual lives comprise these co-occurring conditions in unique ways. In fact, there are 168 distinct life histories that emerge from these 17 components (i.e., one for each of the 168 resilient women) or the statistician’s nightmare of one case per cell in a multi-way table.

[Table 4 about here]

The analytic task at this point is to balance the competing aims of retaining the richness and texture of individual lives, yet at the same time seeking to simplify the variability in more parsimonious summaries. Our solution is to follow procedures that reduce the complexity by focusing on subgroups of variation within our resilient women. That is, we organize the 17 components in various combinations that illustrate diverse life history pathways to psychological resilience. This procedure begins by a search for high frequency cells of co-occurring conditions among combinations of the 17 components. Specifically, frequency counts of co-occurring conditions (beginning with two variables at a time in Table 4, moving to three variables at a time, four at a time, etc.) are generated

with the intent of bringing together as long a partial history of co-occurring conditions as possible, without losing a stable frequency count set at $n > 20$ cases. In particular, we begin with all 136 two-way tables of counts based on distinct pairs of variables in the 17-variable AACR list. In each two-way table we identify the cell with the highest frequency. We then identify the cell among all 136 two-way tables with the highest frequency. This cell corresponds to the most frequent pair of co-occurring conditions -- e.g., [at least one parent is not a high school graduate] and [no chronic alcoholism in the respondent's childhood home].

As a next step we examine all 680 three-way tables and again identify the cell among all the tables with the highest frequency. This cell corresponds to the most frequent set of three co-occurring conditions -- e.g., [at least one parent is not a high school graduate] AND [no chronic alcoholism in the respondent's childhood home] AND [started first job by age 26 and ≤ 1 involuntary job termination]. We continue this process for k-way tables with $k = 4, 5, \dots$ etc. until the largest value of k for which the highest frequency cell has at least 20 persons. For the subgroup H_1 , the process stopped at $k = 7$ yielding the 7-component logical AND statement defined by the conditions in Appendix B as a representation of a sub-population of the resilient women with a distinctive kind of history. [See Appendix B for technical notes]

For the resilient women, this progression resulted in a partial history comprised of six circumstances: (I) neither parent is a high school graduate; (ii) no chronic alcoholism in the respondent's childhood home; (iii) respondent never lived with or was married to an alcoholic during adulthood; (iv) respondent was never a single parent; (v) respondent experienced upward mobility at work, between first job, 1975 job, and current or last occupation in 1992; and (vi) respondent compares him/herself favorably to parents and siblings, in terms of educational, occupational and financial achievements. Of the 168 women, 26 (15.5 percent) showed these co-occurring conditions. Together, these life history components tell a largely positive story; i.e., one of the absence of

adversity as well as the presence of advantage. Even the low profile on parental education -- usually interpreted as a source of disadvantage -- may have made it possible for these women ultimately to compare themselves favorably with their parents and siblings. It is also worth noting that 85% of the women in this subgroup were in the top 33 percent of all sample members in terms of high school grades, IQ, or both.

What, given the array of advantages, explains why these women experienced depression - a defining factor of resilience? To answer this question, we consider information pertaining to the women's experience of acute events.⁷ First, all individuals in this subgroup had experienced the death of at least one parent. In addition, 73% of these women participated in care-giving for an ill person or had at least one chronic health problem themselves. Approximately half of these women had two or more chronic health conditions. Thus, for this particular subset of resilient women (see **H₁** subgroup in Appendix B for the Boolean statement pertaining to these lives), the life story appears to have been one of a series of difficulties with very particular acute and chronic adverse experiences, combined with the absence of other major adversities. On the advantage side was the self-esteem promoting experience of upward job mobility, perhaps ensuing from high early standing on ability and school performance.

The above women comprise less than a fifth of the full group of resilient women. What about the remaining 80%? To explicate their life histories, we repeat the above steps (i.e., generate frequency counts of co-occurring conditions that string together partial histories; then use these and additional acute event variables to distinguish them from the remaining resilient cases). Thus, eliminating the **H₁** subgroup from consideration, we search for the longest possible AND statements characterizing the second distinctive subgroup (using the concentration measure described above).

⁷ Acute events include occurrences such as deaths to parents, siblings, or children; and divorce.

This strategy alone did not produce further meaningful subgroups, suggesting that Boolean statements characterizing additional distinctive sub-populations must contain both AND and somewhat more complex OR statements. Identification of these subgroups is an interactive process governed, on the one hand, by exploratory counts of high frequency AND and OR statements, and on the other, by judgments tied to the organizing principles. Following these procedures, the remaining resilient women were further partitioned into three additional subgroups. Boolean specifications of **H₂**, **H₃**, and **H₄** are provided in Appendix B. Text descriptions are briefly summarized below.

The second major subgroup, **H₂**, is comprised of 48 women for whom a primary early-life adversity was growing up with alcohol problems in the home. All women in the subgroup met this condition. In addition, a large segment (65%) of these women had experienced 3 or more major acute events (e.g., deaths of parent, spouse, child, divorce, job loss). However, these same women had important life advantages (at least one of the following four): (a) social relationships (i.e., regular visits with friends, close confidante, close with spouse, participation in civic or religious groups); (b) first employment by age 26 and, at most, only 1 involuntary job termination; (c) stable or upward occupational status from age 35 to 54; (d) saw themselves as comparing favorably with the parents and siblings in educational and occupational attainment. Thus, these individuals had lives involving significant childhood and adult adversity, but possessed notable advantages in the interpersonal and/or occupational realm, along with positive comparative evaluations. It is the latter that offer insight to account for their high well-being in midlife.

The third major subgroup, **H₃**, consists of 35 women for whom advantage was apparent in early life -- all of these women had parents who were high school graduates and there were no alcohol problems at home. Further, the women had high starting abilities: 83% were in the top two-thirds on both high school grades and IQ. However, in the years following high school, they confronted

various forms of adversity. All cases had at least one of the following six conditions: (a) less than four of five positive social relationship conditions (see \mathbf{a}_6 of Table 4); (b) downward occupational mobility; (c) more than one spell of involuntary job termination; (d) divorced and raising one or more children; (e) caring for an ill person; (f) viewed themselves as doing worse than parents or siblings on social comparisons. In addition, slightly more than half of these women had experienced 3 or more major acute events. Thus, these lives were characterized by various forms of work and family adversity occurring in adulthood, but the women began their life journeys with important starting strengths and resources which likely facilitated their recovery from the adverse experiences.

The last and largest subgroup, \mathbf{H}_4 , consists of 58 women for whom early life showed mixed advantages (none had alcohol problems in childhood home) and disadvantage (all had at least one parent with less than a high school diploma). The majority of these women (55 of 58) also grew up in intact families. As life unfolded, however, the women encountered at least one of an array of adversities: (a) more than one spell of involuntary job termination; (b) downward SEI job mobility; (c) lived with an alcoholic during adulthood; (d) divorced and raising one or more children; (e) fared worse than parents and siblings on social comparisons. In addition, approximately half of these women had high profiles of major acute events, experiencing 3 or more. This final subgroup thus had known considerable difficulty in life. While they possessed certain early resources, they may also have suffered the limited career encouragement and opportunities linked with low parental education. Given this array of negatives, what explains the resilience of these women? Here, we point to the need for additional information, particularly with regard to those guiding principles for which the WLS data set is currently limited: namely, what characterizes the *reactions* of these women to their life challenges? Greater knowledge of their ways of framing and interpreting life difficulties may help account for their high midlife well-being.

In summary, our analysis suggests there are multiple paths to resilience, defined as the

regaining of high well-being following prior depression. The four subgroups document the notable diversity in the nature of what was bad and good in these lives: difficulties occurred across multiple life domains, some were chronic and enduring, others acute, some occurred early in life, others later in adulthood; the advantages and resources also varied across life domains and by when they occurred. From this variety emerged differing tales of why individuals succumb to depression and what was the route out of it. Our distillation suggested four primary patterns among the 168 women, each of which included its own variation around themes. The finely nuanced, thick descriptions of individual lives were thus thinned to life stories characteristic of multiple subgroups.

(Step 5) Conduct tests of distinguishability.

Our final step addresses the capacity of these diverse life stories to distinguish resilient women from other groups in the larger mental health typology. We conduct these tests with the lives of the four subgroups of resilient women generated in the prior step. The essential question is whether their life histories are unique; that is, not strongly evident in the other three mental health groups (i.e., Depressed, Vulnerable, Healthy). Table 5 summarizes the findings from these analyses.

[Table 5 about here]

The columns in the table identify the four mental health groups. The rows of the table are divided into four sections, one for each subgroup within the resilient women ($\mathbf{H}_1 - \mathbf{H}_4$). The first row (in bold) in each section indicates the proportion of individuals within each of the four mental health groups that possess the life history summarized by the $\mathbf{H}_1 - \mathbf{H}_4$ Boolean statements. The number in parentheses beneath each of these proportions signifies the number of women within the mental health subgroup who belong to the category of history listed in the first column. For instance, 26 of the 158 resilient women (or 15.5%) belong to category of history \mathbf{H}_1 .

The $\mathbf{H}_1 - \mathbf{H}_4$ Boolean statements do not include information on the magnitude or timing of acute events in respondents' life histories. Therefore, for each resilient subgroup, we then add in the

next three rows, which contain information about the frequency of acute events (≥ 3) and their timing (≥ 2 before age 40). Specific acute events and the respondent's age when they occurred were not included in the searches that defined $H_1 - H_4$, because this level of specificity was too idiosyncratic and would not lead to any combining of individuals into sub-populations. A further supplement in each analysis pertains to the ability profiles of respondents (i.e., being in the top 33 percent on high school grades and IQ) -- this information emerged as salient in the distillation of the 17 components of AACRs (Step 4), but did not show sufficient concentration to define a distinct subgroup. In combination, the supplemented Boolean statements include all of the information in the components of AACRs. The values within the table are proportions of individuals in each subgroup showing the particular life history specified. For example, in the second row of the resilient women column, we see that 9 women - or 34.6 percent of the 26 resilient women with H_1 histories - are further characterized by the condition "experienced three or more acute conditions". Finally, multiple statistical tests are reported, varying in stringency, number of comparisons made, and sample size.

Analyses for the first subgroup of Resilient women, H_1 , show that with just the Boolean summary these women are not distinguished from any of the other mental health subgroups. However, when the volume of acute life events was added to the Boolean summary for H_1 , it was found that this subgroup of Resilient women were also distinguished from the Vulnerable and the Healthy, with a significantly higher proportion of them having the H_1 Boolean profile plus 3 or more major acute events. (Note, our earlier characterization of this subgroup showed that for a majority of these women, one of the acute events was death of parent.) The temporal organization of these events (i.e., having two or more of them occur before the age of 40) further distinguished the lives of these women from the Depressed subgroup. The final test in this subgroup adds ability assessments (i.e., being in the top third of IQ and high school grades). With this additional characteristic, it is shown that the first subgroup of Resilient women differed most notably from the

Healthy, and secondarily from the Depressed, by virtue of their high ability profiles added to the Boolean statement.

The second subgroup of Resilient women, H_2 , is distinguishable from the Vulnerable when comparisons are made with only the Boolean summary statement. However, the addition of 3 or more acute events in the lives of these women further distinguishes them from the Healthy, and less strongly so, from the Depressed. The timing of acute events (having 2 or more before age 40) and the high ability characteristic, added separately to the Boolean statement, also clearly distinguished these women from the Depressed group.

The third subgroup of Resilient women, H_3 , shows no distinguishability from the other mental health groups at the level of the beginning Boolean summary. The addition of 3 or more acute events to this history does, however, distinguish these Resilient women from the Healthy. The supplemental temporal assessments (having at least 2 acute events before age 40) further distinguished these women from the Depressed. The ability assessments, defined in terms of high performance on high school grades and IQ, does not add further differentiation.

Finally, the H_4 subgroup is not distinguishable from the other mental health groups on the basis of the initial Boolean summary. However, the addition of 3 or more acute events to such life histories clearly differentiates this group of Resilient women from the Vulnerable and the Healthy. Adding the timing of these events (experiencing 2 or more before the age of 40) further distinguishes these women from the Depressed. In sum, the preceding tests of distinguishability reveal that the life histories of the four subgroups of resilient women were, in fact, distinct from the other mental health groups. All varieties of resilience were discriminated from all other mental health groups, although for some the uniqueness was evident at the level of the initial Boolean summary, while for others it was the Boolean summary combined with the high prevalence of acute events, the timing of these events, or the personal ability profiles. The strength of the discrimination (p values, number of

comparisons made, sample size) also varied across comparisons.

In reviewing the tests of distinguishability, it is important to remember that the prevalence of prominent life history patterns among the resilient women do not speak directly to the question of what life history patterns predominate in the other mental health groups. This answer requires that the methodological steps outlined herein be repeated with those in the Healthy, Vulnerable, and Depressed subgroups. Such analyses may well result in distillations of core variables (Step 3) quite distinct from those emerging for the Resilient women. And, the magnitude of subgroup variation within such core variables may differ across the mental health groups. In short, the present analyses illuminate the uniqueness of the life histories of the Resilient women relative to the other groups, but they do not explicate the specific life histories that best characterize the Healthy, the Depressed, or the Vulnerable.

Finally, we are mindful that none of the original variables or the 17-component AACRs are measured without error. The joint response uncertainty on all the variables collected in WLS is unknown, and possibly unknowable. We can, however, carry out sensitivity analyses in which we ask how much error in the variables, for example the AACRs, can be tolerated before our constructed histories are no longer supported by the data. This is an important additional future analytic step. Ideally, it should be coupled with studies that directly assess response uncertainty on the principal life history variables.

Conclusion: Alternative Methods and Vital Dialectics

The skeptical reader may look at the work summarized herein and argue that a simpler, more efficient route to understanding diverse mental health outcomes is to pursue single, or limited numbers of, particularly powerful life history variables. Most extant research could, indeed, be characterized as the search for these key factors. To such advocates, we reiterate our primary objective -- to provide understanding of the complex life history pathways to diverse mental health

outcomes. Thus, even where powerful single influences may exist, our objective is to elaborate the life that precedes and follows these pivotal events/conditions. Simply put, the unfolding of the full life is the desideratum of the present approach. Tied to this life history objective is also the elaboration of “varieties” of pathways within mental health groups. Again, in contrast to prevailing strategies, our intent is to fill in the typically neglected territory that exists between idiosyncratic case study analyses and conventional nomothetic approaches.

Having described the key elements of our methodology, we think it important to consider alternative life history methods. Traditional methodologies for working with these data sets, as we noted at the outset, are based on “variable-centered” rather than “person-centered” approaches. Few existing statistical procedures allow researchers to examine the cumulative and interdependent effects of both social structural and individual psychological characteristics on outcome variables. Measurement and structural equation models do allow for the examination of multiple indicators simultaneously and of direct and indirect effects on multiple indicators. However, higher-order interaction terms needed to capture the interdependent effects integral to a “whole life” approach almost inevitably lead to unstable parameter estimates.

Event history analysis, particularly well-suited to longitudinal data, allows researchers to describe life events and pinpoint the causes and timing of transitions or qualitative change in life histories (e.g., determine the probability and predictors of divorce, remarriage, job terminations, etc.) (Allison, 1984; Flinn and Heckman, 1982). Although event-history methods use event sequence information, the high-order interactions necessary to characterize cross-domain experience in the past that influences present behaviors again lead to parameter instability. One might argue that complex Boolean statements summarizing relevant pieces of the past could be incorporated in event history models using dummy variables. However, the problem therein is one of delineation/discovery of the relevant Boolean statements in the first place. Extant event history and structural equation models

are not sufficiently sensitive tools for this purpose.

With regard to narrative data, Abbott (1992) has criticized extant methodologies (time-series methods, event-history methods, sequential game theory methods) for analyzing only fractions of narrative data, or assuming that it is the immediate rather than the distant past that matters, or collapsing past careers into two or three linear relationships. Brooks-Gunn et al. (1991) also noted that such models derived from the life course perspective do not always focus on temporal, process-oriented or contextual features of life-course patterns.

As a whole, these formal quantitative models tend to involve statements about the action of a single variable, or segment of a history of responses on a single variable, holding other quantities or segments of histories constant. We counter that much of the explanation that seems most defensible -- especially when answering the question 'how did this outcome evolve' -- is formally representable as sets of complex Boolean statements. These involve both 'and' statements describing the co-occurrence and interaction of multiple conditions over time, and 'or' statements. Linear equations relating a list of variables do not capture the notion of co-occurrence in 'and' statements, or the notion of a set of possible alternatives in an 'or' statement. Any attempt to do so would necessarily escalate into a quagmire of high-order interaction terms.

Moreover, traditional variable-centered representations via stochastic process models place an inappropriate emphasis on something thought of as a typical, or average, trajectory. The fluctuations about typical trajectories that are incorporated in stochastic process specifications are accounted for via either latent processes interpretable within a sharply delineated theory, and built into the model, or disturbance/error processes which, in the problems we are treating, have scant substantive basis for their specification.

We believe that an important feature of life histories is the heterogeneity of experience that can lead to a given outcome. This heterogeneity can be more sensitively represented by the variation

observed across multiple strings of Boolean statements - each of which is a distillation of the essential features of the life history for a single individual that explains his or her outcome. An explanation of a given outcome for a group, or population, is more effectively provided by the verbal and quantitative description of a broad family of strings of Boolean statements with considerable diversity among them.

It is important to point out that some of the overall program we are advocating, and a philosophy similar in kind, has been put forth by Ragin and colleagues (see Ragin, 1987). Ragin's approach begins with strings of Boolean statements from multiple case histories, and then utilizes prime-implicant tables to generate a Boolean statement of minimum complexity that summarizes a family of strings of statements for a given outcome group. One of the new contributions in the present paper is the development of a quantitative portrait of the variation within (by partitioning) and between (by statistical tests) families of strings of Boolean statements; this is essential for dealing with the tension between the idiosyncracies of microscopic-level ethnography and the development of more generalizable, population-level statements.

Apart from these contrasts with alternative methods, we stress that our efforts to understand the life histories linked with particular mental health outcomes have benefitted from a series of vital dialectics. Constructive, if not essential, tensions are generated by movement back and forth between thickly described, finely nuanced details of individual lives and the thinner, less textured summaries of groups of lives. Rather than cast allegiance to an exclusively idiographic or nomothetic approach, we have tried to traverse the territory between these two levels. Similarly, we have acknowledged the vitality that comes from working with both qualitative, narrative data sources and quantitative, structured survey data. Although the Wisconsin Longitudinal Study is characterized primarily by the latter, we see the power of the former to enrich understanding of these unfolding lives.

Our approach has also exploited the valuable tension that exists between scientific pursuits

conducted in a largely deductive fashion, and those guided by inductive strategies. At the outset, we defined five key principles with which to organize the extensive life history data. These guideposts comprised a priori hypotheses about how experience cumulates in people's lives to have consequences for their mental health. Such principles were invoked repeatedly as we progressed through the steps of data analysis. However, there were also occasions in which the enterprise was informed by sheer frequency counts of co-occurring life conditions. Thus, it is the blend of working up from the data and down from the guiding principles that accounts for whatever understanding has been achieved.

Finally, we have tried to find an effective interface between human visual perception capabilities (i.e., how much information about individual lives can be processed in the mind) and the capacities of multivariate models to integrate high dimensional numerical data (for a detailed discussion on the limits of human information processing, as it pertains to co-occurring concepts, see Miller, 1956). Our analytic steps thus involved continuous interplay between the mind and the machine, both of which are essential to the task of understanding the complexity of human lives.

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Table 1. Life Events and Conditions Assessed in the WLS

Family Background : *number of siblings and birth order * occupation, industry and SEI (both mother and father) when R was growing up * parents' education * household income * parental care and protection * family conflict * if lived with both parents through high school*

Intelligence : *Henmon-Nelson (high school) * WAIS (most recent interview)*

Adolescent Aspirations and Resources : *occupational and educational plans and aspirations while in high school * plans and desires for college and training * desired occupation * plans to join military * perceived encouragement of parents and teachers for R to go to college * plans of friends to attend college*

Education and Training : *percentile ranking on high school grades * dates of attended, completed/quit college, post-high school training programs and graduate school * dates when degrees were received * fields of study*

Characteristics of Jobs : *age first civilian job * age started and left jobs * SEI * time pressure * repetition * physical stress * co-worker's education * supervisory duties * extent to which R was supervised by others * R's control over others rate of pay * whether R could hire and fire others * managerial and professional status * satisfaction with job * pay * perceived chance to get ahead in job * aspirations for next decade * perceived chance achieving aspirations * retirement plans * age of retirement*

Marriage and Parenting : *Age at each marriage, divorce and widowhood * spouses' parents' occupation * spouses' work history * ever married/ lived with an alcoholic * closeness and similarity to current spouse * closeness to a randomly selected child * age of birth/adoption of all R's children * did not want child when born * health problems of parents and children*

Social Support and Social Participation : *availability of confidant in family * availability of confidant outside the family * frequency of visits with friends, involvement with community organizations * church attendance * instrumental support received * perceived availability of support * caregiving to spouse, children and parents*

Health and Health-Related Behaviors : *perceived global health * perceived change in health over 10 years * satisfaction with current health * perceived health relative to others own age * number and frequency of symptoms * discomfort due to symptoms * 18 chronic illnesses * age at menopause, menopausal symptoms, hormone usage and reproductive surgery (women only) * exercise * cigarette smoking * alcohol use * ever felt guilty about or criticized by others for drinking * drinking caused family problems or problems at work * health insurance*

Social Comparisons and Goal Attainment : *perceived levels of educational, occupational and financial accomplishment relative to a randomly selected sibling, best friend from high school, same-sex parent, and selected child * perceived success in education, finances and work * closeness to goals for life*

Acute Events : *age when divorced * age when parents, spouses and children died*

History of Depression : *age of first, last, and worst episode * number of episodes * length of episodes * functioning between episodes*

Note: Italicized items were used to construct variables for Step 3 in analysis of resilient women

TABLE 2: CHRONOLOGICAL CHART - Characteristics of Resilient Woman, By Age and Organizing Features: Wisconsin Longitudinal Study 1957-1994

	<i><18</i>	<i>18-29</i>	<i>30-39</i>	<i>40-49</i>	<i>50+</i>
DOMAIN					
[1] CUMULATION OF ADVERSITY	Lived w/problem drinker		Father died Brother died	Mother died Worst spell of depression Divorced [5] with kids	
[2] CUMULATION OF ADVANTAGE	Catholic Attended church 1/week	On-the-job training program [4] Married financial manager [5] Briefly promoted to clerical supervisor [4] First birth [5] Second birth [5]	Third birth [5]		
[3] REACTIONS TO ADVERSITY & ADVANTAGE AND ASPIRATIONS	No college plans Parents didn't care if she attended college Planned to get office job Marriage influenced future plans	Somewhat dissatisfied with job ----- Very dissatisfied with chance to get ahead-----		Remarried to laborer [2], [5]	Very satisfied with job
[4] SOCIAL HIERARCHIES	Father, 6 yrs. education [1] Mother, 8 yrs. education [1] Father - repairman Mother - Didn't work IQ = 112 [2] Top 25% HS class rank [2]	Began job as clerical worker at insurance company----- ALWAYS worked under time pressures [1]----- SOMETIMES held responsible for things out of her control [1]-----		Took job as administrative secretary, insurance co. [2]-----	Church involvement
[5] SOCIAL RELATIONSHIPS	One of 9 children		10 visits with friends/month		Very close with husband

NOTE: Numbers in brackets [] refer to other organizing features for the same item (i.e. there is cross-feature linkage).

TABLE 3: ABSTRACTED CHRONOLOGICAL CHART - Based on chronological chart of three resilient women

	Prior to age 18		Age 18 and older
CUMULATION OF ADVERSITY	Alcohol or other family health problems		At most 2 involuntary job terminations {Chronic alcohol or other family health problems involving parents or spouse} OR {Death of at least one of: mother; father; or sibling by age 45} {1st episode of depression before age 36 if at least 2 acute negative events} OR {1st episode of depression after age 36 if chronic negative family circumstances and at least one acute event}
CUMULATION OF ADVANTAGE			No long-term unemployment from start of work career through 1993 At least two children before age 27 Husband persistently employed {Persistent good self-rated health} OR {Non-work limiting physical health problems or behaviors}
REACTIONS TO ADVERSITY & ADVANTAGE AND ASPIRATIONS	Parents indifferent to college 1st job or college plans matched HS peers HS marital plans influenced job/college decisions	OR	At least 3 of the following job traits (I) - (v): {I} Low autonomy [4] (ii) Low control [4] (iii) No supervision of others [4] (iv) High time pressures [1] (v) Somewhat dissatisfied with job
SOCIAL HIERARCHIES	IQ > 110 [2] Class rank >75th %ile		Low/medium SEI jobs, some part-time jobs Work history starts before age 26 Persistently post-HS or post-2nd husband, has at least 4 out of: (I) Very close with spouse [5] (ii) Frequent visits with friends [2],[5] (iii) At least one of friends, children is close confidant [5] (iv) Participates in at least one organization (e.g. PTA) [2] (v) Deep religious faith and involvement w/church [2]
SOCIAL RELATIONSHIPS	< 3 siblings		{Married only once} OR {At most 1 separation, divorce [1] and remarriage [2],[3]}
			Parents indifferent to college 1st job or college decision matched HS peers HS marital plans influenced college or job decision Father's occupation is low/medium SEI At least 3 siblings Intact family [2]

NOTE: Numbers in brackets [] refer to other organizing features in a cross-feature linkage of the same item.

Table 4: Core Variables Defining Resilient Histories of WLS Respondents (n =218)

<i>Age < 18</i>	<i>Age 18-36</i>	<i>Age 36-54</i>	<i>Age 54+</i>
a1 High school grades	a6 At least 4 of 5 social relationship conditions:		
a2 I.Q.	(I) Regular visits with friends in 1975 and 1992-----		
a3 Parental education	(ii) At least one close confidant-----		
	-		
a4 Alcohol problems at home	(iii) Participation in civic organizations, 1975 and 1992-----		
	(iv) Reports being “very close” with spouse-----		
	(v) Regular participant in religious organization/church-----		
	a7 Started first job by age 26, and has no more than one involuntary job termination.		
	a8 Upward career mobility, 1975 to 1992, measured by change in occupational status.		
	a9 Supervisory status in 1975 and 1992 jobs, or increase in supervisory duties, 1975-1992.		
	a10 Stressful work conditions-----	a5 Compares self favorably to parent, sibling, in terms of work, education, or finances.	
	a13 Live(d) with problem drinker-----		
	a14 Divorced with child(ren).-----	a11 Chronic health problems	
	a15 Providing care to ill relative or friend.-----		
		a16 Physical health worse than 10 years ago-----	
	a17 Involuntary spell of unemployment lasting six months or longer.-----		

Table 5: Tests of Distinguishability, By Mental Health Subgroup and Category of History

Category of History	<u>Resilient</u>	<u>Depressed</u>	<u>Vulnerable</u>	<u>Healthy</u>
H₁	.155 (26)	.098 (6)	.190 (23)	.197 (176)
H ₁ and ≥3 acute conditions	.346 (9)	.500 (3)	.130 ^{^(75,75)} (3)	.176 ^{^(100,600)} (31)
H ₁ and ≥2 acute conditions before age 40	.307 (8)	0* (0)	.130 (3)	.159 (28)
H ₁ and top 1/3 of H.S. grades and IQ rankings	.846 (22)	.50 ^{^(26,40)} (3)	.565 (13)	.443* (78)
<hr/>				
H₂	.285 (48)	.295 (18)	.140* (17)	.211 (189)
H ₂ and ≥3 acute conditions	.645 (31)	.278 ^{^(48,48)} (5)	.647 (11)	.343* (65)
H ₂ and ≥2 acute conditions before age 40	.333 (16)	.111 ^{^(96,36)} (2)	.411 (7)	.269 (51)
H ₂ and top 1/3 of H.S. grades and IQ rankings	.688 (33)	.166* (3)	.412 (7)	.540 (102)
<hr/>				
H₃	.208 (35)	.180 (11)	.173 (21)	.190 (173)
H ₃ and ≥3 acute conditions	.514 (18)	.545 (6)	.429 (9)	.317 ^{^(70,346)} (155)
H ₃ and ≥2 acute conditions before age 40	.286 (10)	.545 ^{^(105,66)} (6)	.238 (5)	.219 (38)
H ₃ and top 1/3 of H.S. grades and IQ rankings	.743 (26)	.545 (6)	.571 (12)	.647 (112)

Table 5: Tests of Distinguishability, By Mental Health Subgroup and Category of History (cont'd)

<u>Category of History</u>	<u>Resilient</u>	<u>Depressed</u>	<u>Vulnerable</u>	<u>Healthy</u>
H₄	.345 (58)	.393 (24)	.487 (59)	.323 (288)
H ₄ and ≥3 acute conditions	.50 (29)	.417 (10)	.237* (14)	.281* (81)
H ₄ and ≥2 acute conditions before age 40	.276 (16)	.083 ^{+(75,60)} (2)	.135 (8)	.204 (59)
H ₄ and top 1/3 of H.S. grades and IQ rankings	.448 (26)	.542 (13)	.407 (24)	.486 (140)

NOTE: Tests of distinguishability yielded the following results:

* - Significant at $p < .05$ -- 95% confidence interval does not contain 0; *the interval is one of a set of simultaneous confidence intervals based on the 48 comparisons in the table.* Confidence intervals were computed by using the Bonferroni's t-statistic, which takes into account the total number of comparisons being made (Miller, 1981; Pp. 218-219, 238).

+ - Significant at $p < .05$ -- 95% confidence interval does not contain 0; *the interval is based on only the single comparison.*

^ - Significant $p < .10$ -- 90% confidence interval does not contain 0; *the interval is based on only the single comparison.*

(N₁, N₂) - The minimal sample sizes for resilient and comparison groups, respectively, to ensure that observed difference in percentages is significant at $p < .05$, *taking into account the 48 simultaneous comparisons.*

Appendix A: Example of a Single Life History Summarized by a Logical AND Statement

Part 1: Tabular Presentation of Conditions and Events Describing the Life History of a Resilient Woman

<u>Age <= 18</u>	<u>18 < Age < 54</u>	<u>Age 54+</u>
-Grew up in intact family	Strong social support network:	-Describes self as doing better than sibling in terms of finances, and similar in terms of work and education
-Did not live with a problem drinker in the childhood home	- Has a close confidant	
-Neither parent is a H.S. graduate	- Had frequent visits with friends over time	
-High school grades in top 33%	-Regular participant in religious organization(s)/church	-One chronic health problem
-IQ score in top 33%	-Regular participant in civic and community organizations	-Physical health is somewhat worse than it was ten years ago
	-Somewhat or very close to spouse	
	-Started work in family business and never had an involuntary job termination; hence no spell of unemployment lasting >6 months	
	-No downward occupational mobility, defined by SEI	
	-Attained supervisory status on job after age 36	
	-Time pressure is the only stressful aspect of supervising family business	
	-Never lived with a problem drinker during adulthood	
	-Never divorced nor raised child as a single parent	
	-Engaged in caregiving for parents while in late 40s and early 50s	
	-First depression at age 51	
	-Mother died when R was age 52	
	-Father died while R was age 52	

Appendix A: Example of a Single Life History Summarized by a Logical AND Statement

Part 2: Discussion of Boolean String Describing the Life History of a Resilient Woman

The individual depicted in the preceding chart (Appendix A1) is in the life history category H_1 among the resilient women. Her life is characterized by the absence of adversity as well as the presence of advantage. The notable exception to this pattern is the persistent care of both parents that ended when she was 52 years old, and both parents died within the same year. Their deaths were preceded by severe depression when the woman was 51 years old.

A formal Boolean statement summarizing this history has the form:

$$\bigwedge_{k=1}^{17} [a_k=l_k] \quad \wedge \text{ [death of mother when respondent is 52]} \\ \wedge \text{ [death of father when respondent is 52]} \\ \wedge \text{ [first and worst episode of depression when respondent is 51],}$$

where the levels l_1, \dots, l_{17} for the variables a_1, \dots, a_{17} are:

$$\begin{array}{ccccccccccccccccccc} a_1 & a_2 & a_3 & a_4 & a_5 & a_6 & a_7 & a_8 & a_9 & a_{10} & a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} & a_{17} \\ 3 & 3 & 0 & 0 & 0 & 0 & 0 & 0 & 3,2 & 1,1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 \end{array}$$

APPENDIX B: Technical Notes Describing Methodology
Part 1: Methodological Notes, Boolean Logic

The four categories of histories, \mathbf{H}_1 - \mathbf{H}_4 , that describe multiple pathways to depression with subsequent high well-being can be represented in terms of formal Boolean algebraic operators. To this end let \wedge denote the AND operation and \vee denote OR. Then if A and B are labels for two conditions in the lives of the resilient women, $A \wedge B$ means that *both* A and B occur. $A \vee B$ means that either A or B or both A and B occur. If, for example, A is the event $[a_3 = 0]$ = [neither parent is a HS graduate] and B is the event $[a_4 = 0]$ = [no alcohol problems in the childhood home], then $A \wedge B = [a_3 = 0] \wedge [a_4 = 0] = \{[\text{neither parent is a HS graduate}] \text{ AND } [\text{no alcohol in the childhood home}]\}$.

If A_1, A_2, \dots, A_K are labels for K conditions, then the symbol $\bigvee_{k=3}^8 A_k$ means that either A_3 OR A_4 OR ... OR A_8 occurs. This can be stated in somewhat simpler terms as: {at least one of the six conditions, A_3, A_4, \dots, A_8 , occur}. Similarly, the symbol $\bigwedge_{k=3}^8 A_k$ means that A_3 , AND A_4 , AND ... AND A_8 occur. Equivalently, this can be stated in the form: {all of the conditions A_3, A_4, \dots, A_8 occur}. Picking any two indices $k_1 < k_2$ where $k_1 \geq 1$ and $k_2 \leq K$ we can represent OR statements involving multiple conditions in the general form $\bigvee_{k=k_1}^{k_2} A_k$ and AND statements in the form $\bigwedge_{k=k_1}^{k_2} A_k$. With this notation at hand the four categories of histories, $\mathbf{H}_1 - \mathbf{H}_4$, may be represented as:

$$\begin{aligned} \mathbf{H}_1: & \bigwedge_{k=3}^5 [a_k = 0] \wedge \bigwedge_{k=7}^8 [a_k = 0] \wedge \bigwedge_{k=13}^{14} [a_k = 0] \\ \mathbf{H}_2: & [a_4 = 1] \wedge \bigvee_{k=5}^8 [a_k = 0] \\ \mathbf{H}_3: & [a_3 = 1] \wedge [a_4 = 0] \wedge \left\{ \bigvee_{k=5}^8 [a_k \neq 0] \vee \bigvee_{k=14}^{15} [a_k \neq 0] \right\} \\ \mathbf{H}_4: & [a_3 = 0] \wedge [a_4 = 0] \wedge \left\{ [a_5 \neq 0] \vee \bigvee_{k=7}^8 [a_k \neq 0] \vee \bigvee_{k=13}^{14} [a_k \neq 0] \right\} \end{aligned}$$

APPENDIX B: Technical Notes Describing Methodology
Part 2: Description of Concentration Measure

The search strategy that identified the 7-component AND statement characterizing \mathbf{H}_1 utilized a measure of concentration of the counts in each of the sub-tables that were examined. A formalization of the concentration measure requires some notation. To this end let $K =$ number of core variables ($K = 17$ in our case). Then for any $J \leq K$, let $n_{i_1}^{(\sigma)}, \dots, n_{i_J}^{(\sigma)} =$ number of individuals with the particular response vector (l_1, \dots, l_J) based on the particular set, σ , of J variables. Observe that there are $\binom{K}{J} = \frac{K!}{J!(K-J)!}$ sets of J variables. Let $N =$ number of individuals in the population whose histories are to be characterized. ($N = 168$ for resilient women). Set $C_\sigma =$ number of possible response vectors based on the variables, σ . If $L_j^{(\sigma)} =$ number of levels in the j^{th} variable in the set σ , then $C_\sigma = L_1^{(\sigma)} L_2^{(\sigma)} \dots L_J^{(\sigma)}$. For a particular set, σ , of J variables define the *concentration* of the realized response set as:

$$[\text{CON}]_J^{(\sigma)} = \frac{C_\sigma}{C_{\sigma-1}} \left[1 - \max_{(I_j^{(\sigma)})} \frac{n_{I_j^{(\sigma)}}}{N} \right] \quad \text{if } C_\sigma \leq N$$

$$\frac{N}{N-1} \left[1 - \max_{(I_j^{(\sigma)})} \frac{n_{I_j^{(\sigma)}}}{N} \right] \quad \text{if } C_\sigma > N$$

Then if $\mathbf{J} =$ set of $\binom{K}{J}$ collections of J variables define $\min_{\sigma \in \mathbf{J}} [\text{CON}]_J^{(\sigma)}$ and $I_J^{(-)} =$ response vector (modal cell) for which $\min_{\sigma \in \mathbf{J}} [\text{CON}]_J^{(\sigma)}$ is attained. $[\text{CON}]_J^{(\sigma)}$ and the response vector for which it is attained represent the most frequently co-occurring conditions in the variable set, σ . The pair $\min_{\sigma \in \mathbf{J}} [\text{CON}]_J^{(\sigma)}, I_J^{(-)}$ identifies the maximally concentrated set of J response vectors and the corresponding set of modal co-occurring conditions $I_J^{(-)}$. The extreme cases occur when $[\text{CON}]_J^{(\sigma)} = 0$, in which case all observations are in one cell, and when $[\text{CON}]_J^{(\sigma)} = 1$, in which case observations are equally distributed among all cells. $[\text{CON}]_J^{(\sigma)}$ can also be related to the large class of diversity measures—see Patil and Taillie (1982) for a review—by simply observing that large values of this measure correspond to high diversity and small values correspond to high concentration.

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