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LINKING LIFE HISTORIES AND MENTAL HEALTH: A PERSON-CENTERED STRATEGY

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We present a strategy for using longitudinal survey data to identify life history pathways linked with mental health outcomes. The central aim is to begin with richly detailed descriptions of individual lives and, from them, to discern generalizable features of aggregates of multiple lives. Conceptual principles guiding the organization and interpretation of life history information are summarized. Data from the Wisconsin Longitudinal Study (WLS) are used to illustrate the specific steps for analyzing life histories of "resilient" women (those with a history of depression who report high levels of current well-being). The steps begin with writing narratives of individual life histories, which are then reviewed for commonalities, and subsequently thinned to more generic descriptions. The process culminates with tests of distinguishability, contrasting the "resilient" with three other mental health groups. Illustrating the constructive tensions between idiographic and nomothetic analyses, our approach documents multiple life *pathways to resilience. The methodology also underscores the delicate interplay between activities of the mind and machine in facilitating scientific discovery.*

1. INTRODUCTION

In this paper, we present a methodological strategy for generating life histories from longitudinal survey data and use them to differentiate the lives of various mental health groups. Our objective is to characterize the histories in sufficiently general terms so as to represent a population of lives while retaining some of the nuance of individuals' life stories. The analytic strategy is a sequential process of distilling the essential features of life experiences that are linked with four different mental health groups. The full analytic progression is illustrated with the lives of resilient women, who in midlife showed high psychological well-being, despite having previously experienced depression. Our findings document multiple life history pathways to resilience among these women.

To situate our strategy within a larger research context, we first review the substantive questions and methodological strategies in prior life course work in sociology and psychology. Most studies have followed variable-centered, rather than person-centered strategies. We argue that without the person as the unit of analysis, life histories cannot be meaningfully grasped. Single-case studies are, however, insufficient to the task of understanding groups of lives. Thus, what is needed is a strategy that develops the neglected territory between idiographic and nomothetic analytic approaches. This is the place from which our strategy embarks.

Assembling lives is a task of enormous complexity, given the multitude of events, conditions, domains, and temporal particulars that comprise each life. To assist in the process, we invoke a series of guiding principles designed to make sense of great varieties of human experience and their possible connections to mental health. These principles, described at the outset, provide a conceptual structure around which lives can be organized and differentiated. We illustrate our proposed strategy with the life histories of resilient women in the Wisconsin Longitudinal Study.

Five major steps in the analytic progression are described in detail. These include the use of written narratives, at both the beginning and end of the investigative process, as well as computer-based analyses in the middle and concluding steps. The cornerstone of our methodology is the development of chronological representations of life histories, presented as complex Boolean statements that are ultimately elaborated as narratives.

Our procedures involve numerous "decision-points" that we explain in detail, giving emphasis to the critical role of informed judgments of the investigators conducting the investigation. The life history strategy is not fully automated, as we see no substitute for thoughtful decisions at numerous points along the way. Our paper concludes with a summary of the major contributions of the proposed life history strategy and how they contrast with existing methodological alternatives.

2. 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. In sociological life course research, the social structural positions of individuals are generally seen to "determine" or "shape" personality or behavior with little attention paid to the microsocial relations or psychological processes through which macrosocial structures have effects (House 1977).

Substantively, the key questions guiding much research have dealt 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, used the Q-sort procedure to assess whether personality traits change or show consistency through time. He emphasized the "coherence" of personality—the fact that it unfolds in generally predictable and consistent ways across time. Caspi (1987; Caspi, Elder, and Herbener 1990) elaborated similar ideas by showing the adult life consequences of undercontrolled, explosive behavior in early life as well as early shyness and dependency. As a positive counterpoint, Clausen (1993) examined "planful competence" in adolescence and its long-term reach in predicting who would lead stable, rather than crisis-ridden, lives in adulthood. Helson and Wink (1992), in contrast, gave greater emphasis to personality *change* in adulthood and assessed particular life experiences and the timing of events to account for such patterns of change.

The literature on developmental psychopathology (Robbins and Rutter 1990) affords further life history perspectives. Harris, Brown, and Bifulco (1990) offer a "biographical model of the developmental pathways" that link parent care in childhood to adult depression in women. Two interrelated 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 their variable-centered analysis works against enumerating distinct patterns of life histories.

Studies of social stress and its consequences for mental health also reveal increased attention to life history assessments, which go beyond the recent life events checklists to evaluate major childhood and lifetime traumas as well as to track chronic, enduring difficulties (Turner and Lloyd 1995; Turner, Wheaton, and Lloyd 1995; Wheaton 1990). These efforts

underscore Kessler and Magee's (1993) observation that despite the evidence generated on specific adversities or traumas, little is known about the joint effects of multiple adversities. Turner and Lloyd (1995) argue strongly for the systematic inclusion of lifetime experience of social stress and demonstrate clear empirical relationships between *cumulative adversity* and both psychological distress and psychiatric disorder (net of the effects of parental psychopathology). Garmezy (1993) provides further evidence for the link between cumulative adversity and mental health in their examination of childhood psychiatric disorder: the presence of a single stressor (or no stressor at all) produced a 1 percent increment in psychiatric disorder in children. Two stressors in the family complex provided a 5 percent rise in the disorder rate; three stressors, a 6 percent increment; and four or more stressors accounted for a 21 percent increment in the rate of childhood psychiatric disorders. Cumulatively, the presence of stressors accounted for a 33 percent rise in the disorder rate, with multiple stressors accounting for the largest proportion of the disorders. Thus, failure to consider lifetime cumulation resulted in systematic underestimation of the linkages between stress exposure and emotional disorder.

By and large, prior approaches have followed variable-centered rather than person-centered strategies, thereby losing the focus on how multiple events and conditions come together to comprise whole lives. Even explicit efforts to implement person-centered analyses, such as Magnusson and Bergman's (1990) "pattern approach" implemented with cluster analysis, do not keep the "whole person" as the unit of analysis. Studies of long-term consequences of particular events (e.g., the Depression, temper tantrums in childhood, inadequate parental care in childhood), or of the timing and sequencing of select events (e.g., completion of education, marriage, beginning of first job) do not address *full life histories*. Collectively, the methodologies used do not retain a person-centered focus in characterizing complex profiles of life experience. Such comprehensive accounts of lives, covering multiple domains and their interconnectedness across lengthy time spans have been the purview of single-case studies and in-depth psychobiographical accounts (Allport 1937; Murray 1938; Runyan 1983; Vaillant 1993), which are criticized for their lack of generalizability and reliance on arbitrary interpretations (McAdams 1993; Runyan 1983).

Following these observations, our goal is to conduct life history research with a person-centered strategy that is not restricted to single case examples, but is appropriate for large sample survey data. We reject the

apparent "forced-choice" between variable-centered, quantitative, nomothetic alternatives on the one hand, and person-centered, idiographic, frequently qualitative alternatives on the other. Our aim is to retain the person as the unit of analysis, but do so in the context of nomothetic inquiry, where the central question is how multiple lives are similar *and* different. Our procedures utilize both narratives and numbers to assemble and interpret the life histories, thereby revealing a blend of quantitative and qualitative methods. Comprehensive understanding of human lives necessitates such a synthetic approach.

3. DATA SOURCES AND ORGANIZING PRINCIPLES

We employ structured longitudinal survey data to assemble life histories. Such surveys, while frequently lacking the depth and detail of individual biographies and autobiographies, offer the distinct advantage of being able to compare multiple lives on the same kinds of life history information. This potential has rarely been exploited, given longstanding propensities to analyze longitudinal survey data with variable-centered techniques.

Although analysis begins with the full array of characteristics per individual, after careful scrutiny, we whittle this list of variables down to a manageable number of theoretically relevant characteristics while retaining whole lives as the central focus. In the process, there is an inevitable tension between thinning the descriptions of individual lives down for generalization purposes and retaining the maximal number of key descriptive features. It is the relatively thin clusters of generalizable features that are used to conduct statistical tests of the uniqueness of particular life histories associated with specific outcomes.

This process of thinning fine-grained descriptions into clusters of essential characteristics is guided by a set of principles that suggest which characteristics are most essential to explain mental health outcomes (e.g., depression, resilience, positive well-being). These principles are described below. The propositions themselves are not new to the mental health or the stress and coping fields. What is new is the effort to *integrate* them into a framework to guide life-history analysis.

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 is a truism in mental health research (Harris, Brown, and Bifulco 1990; Kessler and Magee 1993;

McLeod and Kessler 1990; Turner and Lloyd 1995; Wheaton 1990). Our approach gives 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."

2. *Advantage and its cumulation over time has positive mental health consequences*. Because we are interested in understanding recovery from and resistance to adversity, 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), or having positive evaluations of one's life (e.g., job satisfaction, marital quality). The idea of cumulative advantage is also not new, having been invoked to explain inequalities in scientific productivity (Cole and Singer 1991; Merton 1968; Allison, Long, and Krauze 1982), or health in the context of educational attainment (Ross and Wu 1996). We broaden the idea to encompass multiple domains of life and hypothesize that experiences of advantage have ameliorative consequences.

   The cumulation of adversity and advantage comprise the superordinate organizing principles for assembling the life-history information, as most experiences (acute or chronic) can be classified within these two broad categories. However, within them are refinements that capture other significant features of the life experiences, which are further organizing principles.

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 (Lazarus and Folkman 1984; Pearlin 1991; Pearlin and Schooler 1978; Menaghan 1983; Thoits 1995; Turner and Roszell 1994) as well as the Cole and Singer (1991) emphasis on reactions to events, we underscore the importance of how life experience is cognitively construed and emotionally experienced. 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 (e.g., Dohrenwend, Levav, and Shrout 1992; Link, Lennon, and Dohrenwend 1993). We conceptualize "position in social hierarchy" as a broader construct than simply one's education, income, and occupational status. Individuals are also differentiated according to hierarchies of abilities (e.g., IQ, academic performance), positions of power and influence in their families and communities, degrees of autonomy and authority in the workplace, and their own self-comparisons with others. 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 broaden social stratification to include hierarchies that pervade everyday life. Negative mental health is seen to result from the cumulative effects of low social standing across diverse domains, and alternatively, high social standing and its cumulation over time is seen to have positive mental health consequences.[1] For a useful historical review of health differentials as a function of social class, see Sorokin (1927, chap. 11).
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 (Cohen and Wills 1985; Dunkel-Schetter and Bennett 1990; House and Kahn 1985; House, Landis, and Umberson 1988; Kessler and McLeod 1984; Thoits 1995; Wheaton 1985; Wethington and Kessler 1986). We consider the buffering effects of quality relationships on difficult life experiences and the role of significant others in contributing to one's sense of positive self-regard, involving feelings of esteem and worth. We also examine balance in the extent to which individuals give and receive time, money, and personal care—those who receive more than they give may also experience lower social standing relative to others. It is the combination of these various aspects of social relationships and their cumulation over time that is

[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).

thought to enhance or diminish mental (and ultimately physical) health statuses.

The central questions guiding our work are *not* about particular predictions following from any of the above principles, but about how these different components come together to comprise full lives. In this sense, the overarching hypothesis is about the *distinctiveness of lives*—namely, that the life histories of different mental health groups will involve distinguishable *combinations* of the above characteristics.

4. METHODOLOGICAL STEPS: AN ILLUSTRATION USING THE WISCONSIN LONGITUDINAL STUDY

The methodological steps for distilling "whole lives" into aggregate pathways, summarized by complex Boolean statements and accompanying narratives, are detailed below. Before presenting them, we describe the Wisconsin Longitudinal Study on which the analyses are based and present the mental health outcomes that the life-history analyses are intended to illuminate.

4.1. *Data*

The Wisconsin Longitudinal Study is a long-term survey 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.[2] Data have been collected on respondents' family background, starting resources, academic abilities, youthful aspirations, social support, social comparisons, and the timing and sequencing of adult educational and occupational achievements, work events and conditions, family events, and physical and mental health. Our analyses will focus on the 5009 primary respondents who participated in all three waves of the WLS

[2]The WLS is unique in its high rate of retention. In 1992–1993, 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 1992–1993, telephone interviews were completed with 89.8% of the living respondents (N=8,493); 20-page mailback surveys were received from 81.0% of telephone respondents (N=6,877) (Hauser et al. 1993).

and who responded to questions assessing affective disorder and well-being in the most recent survey.[3]

Although the WLS sample is limited to persons who were in their senior year in high school in 1957, the data are uniquely appropriate to investigate life course issues. It is the only longitudinal data set containing extensive information 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 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 (Sewell and Hauser 1975, 1980).

Although the Wisconsin Longitudinal Study was originally formulated as a survey of educational and occupational aspirations and attainments over the life course, we borrow Elder's strategy of "recasting" the data to address new questions. Elder and 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 list of relevant WLS data within various life domains is presented in Table 1. Our central question was how to use this enormous array of information, an issue confronting investigators working with any complex longitudinal data set.

4.2. *Mental Health as Outcome*

Our aim is to understand the life histories that characterize four mental health groups: (1) depressed/unwell, (2) healthy, (3) vulnerable, and (4) 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

[3]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).

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 * grew up in intact family*
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 * Rs 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 Rs 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.

defined as the *absence of illness* rather than the *presence of wellness* (Ryff and Singer 1996; 1998). A typological approach underscores our objective of moving away from a variable-centered analysis to a person-centered analysis, which allows us to focus on interacting sets of variables within individuals (York and John 1992).

The four mental health groups are characterized as follows:

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.[4]

Although we refer to these as mental health "outcomes," we view mental health as part of the unfolding life story. Feedback systems are 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.

4.3. *Analysis*

Our analytical strategy involves five major steps: (1) construct life history narratives for a subsample of cases from each of four mental health groups;

[4]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.

(2) identify "commonalities" among the life histories within each mental health category; (3) create a series of response vectors that characterize the traits and life experiences of each of the four mental health groups; (4) summarize and interpret abstracted admissible chronological representations (AACRs) of whole lives, 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. Each of these steps is described in detail below.

Step 1: Write narrative case histories for randomly selected respondents from each of the four mental health categories. We follow Stone's (1979) conception of narrative, defined as "the organization of material in a chronological sequential order and the focussing of the content into a single coherent story, albeit with subplots" (p. 3). Our rationale for writing narratives with survey data (here including 250+ responses per individual) is that the human mind has difficulty processing enormous amounts of information in parallel (i.e., long lists of variables about a single life) (Miller 1956), although it is uniquely suited to process a coherent story (i.e., a written narrative about a life) (Schank 1990).

To generate these narratives, we randomly selected three to six respondents from each of the four mental health groups and wrote a narrative biographical story for each individual. Biographical information was compiled using responses on more than 250 variables spanning the three waves of data collection, 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 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 1977). In each case, the narrative 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 narrative biographies and attempted to find commonalities and variation between the lives of those sharing like mental health profiles. The

narratives facilitated comprehension of whole lives of unique individuals, as a prelude to generating aggregates of lives for each mental health type. The narratives 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 social background, organized according to the guiding conceptual principles, impact midlife mental health.

Life histories are presented here in both narrative and tabular chronological form. An example for a resilient woman is provided below, while the chronological representation is shown in Table 2, which is not a complete record of all the information contained in the respondent's record.[5] Rather it is a first step in the movement from idiographic to nomothetic theory development and testing. We broke down the biography into several clusters of variables, in accordance with our guiding principles. This effectively amounts to carrying out event structure analysis (ESA; Griffin 1993) where the whole life, rather than a single event, is the focus of analysis.

Exhibit A: Narrative Life History of a 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

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

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 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, was involved in the PTA in 1975, and was very involved in the church in both 1975 and 1992. She also reports that in the month

TABLE 2
CHRONOLOGICAL CHART—Characteristics of Resilient Woman, by Age and Organizing Features: Wisconsin Longitudinal Study 1957–1994

DOMAIN	<18	18–29	30–39	40–49	50+
[1] CUMULATION OF ADVERSITY	Lived w/problem drinker		Father died	Mother died	
			Brother died	Worst spell of depression	
				Divorced [5] with kids	
[2] CUMULATION OF ADVANTAGE	Catholic	On-the-job training program [4]	Third birth [5]		
	Attended church 1/week	Married financial manager [5]			
		Briefly promoted to clerical supervisor [4]			
		First birth [5]			
		Second birth [5]			

[3] REACTIONS TO ADVERSITY AND ADVANTAGE AND ASPIRATIONS	No college plans	Somewhat dissatisfied with job.	Remarried to laborer [2], [5]	Very satisfied with job
	Parents didn't care if she attended college	Very dissatisfied with chance to get ahead		
	Planned to get office job			
	Marriage influenced future plans			
[4] SOCIAL HIERARCHIES	Father, 6 yrs. education [1]	Began job as clerical worker at insurance company	Took job as administrative secretary, insurance co. [2]	
	Mother, 8 yrs. education [1]			Church involvement
	Father—repairman	ALWAYS worked under time pressures [1].		
	Mother—Didn't work	SOMETIMES held responsible for things out of her control [1].		
	IQ = 112 [2]	Church and PTA involvement		
	Top 25% HS class rank [2]	Promoted to supervisor in insurance firm [2]		
[5] SOCIAL RELATIONSHIPS	One of 9 children	10 visits with friends/month		Very close with husband

Note: Numbers in brackets [ ] refer to other organizing principles that simultaneously utilize the same item.

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. She perceives a 0 (zero) percent chance that she will lose her job over the next two years.

Five years after her 1983 divorce, 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.

The purpose of Step 1 is thus to do something with survey data that rarely occurs: generate all of the information that exists about a single respondent and weave it together as a narrative account. We assert that the crafting of whole life stories is fundamental to comprehending the processes we seek to understand. New insights are obtained as detailed information about real people are brought into focus. This observation has long been appreciated by life-history researchers of the idiographic, case study variety (McAdams 1994; Mishler 1997; Runyan 1982). Our objective is to elevate the merits of portraying "whole lives" among survey researchers, not as an end in itself but as a crucial beginning step in generating ideas—what McAdams (1994) refers to as the "context of discovery"—that will guide subsequent efforts to understand aggregates of lives on the nomothetic level. Preserving the individual as the unit of analysis, a person-centered strategy, is of fundamental importance.

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 health group, four or five cases per category is insufficient as a sample for selecting commonalities. Therefore, Step 2 involves a random selection of an additional 10 cases from each of the four mental health groups and creation of a computer printout listing outcomes for each respondent on roughly 70 selected variables drawn from the 1957, 1975, and 1992 surveys. We again searched for "commonalities" or shared events and traits that characterized the lives of each mental health type. 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 selecting relevant variables. The idea of numerous researchers working collab-

oratively in this fashion was also central to Murray's Diagnostic Council (1938) as the avenue to understand whole lives.[6]

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 from high school. Eight of the 10 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 at the time of birth. 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 life history elements of each of the four groups, and created an "initial generic life history" (IGLH). An example is depicted in Table 3, which is a chronology based on *multiple narratives* (in this case, information from three women) rather than the idiosyncratic detail of a single narrative (as in Table 2). The variable definitions in Table 3 are, of necessity, at a higher level of abstraction (e.g., "at least 3 of the following job traits (i)–(v) represents substantial adversity in the work place") and represent the "commonalities" that emerged within the group of resilient women from reading the biographies and examining individual case records. The IGLHs indicate the variability in life history detail that will ultimately be a "class" of histories purported to explain an

[6]The need to achieve consensus among investigators raises a question of inter-rater reliability. We did not conduct such analyses because of the dynamic nature of these discussions—levels of agreement or disagreement were constantly shifting as a result of the scientific exchange. Does this mean our procedures are unreliable? We believe not, given that agreement about which variables to keep and which to drop was ultimately achieved, *and* through a more interactive process than is typically followed. Does this mean that our findings lack replicability? This question could be answered by having a different group of investigators follow the same procedures through the data to see if they reach the same conclusions. We encourage skeptics to download the WLS data from the World-Wide Web (http://dpls.dacc.wisc.edu) and conduct such an analysis.

outcome. A central ingredient of the IGLHs are Boolean statements such as "the person must have at least four of the following five conditions." The five sets of four conditions, each one of which is expressed as a logical "AND" statement, are 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) frequent visits with friends; (iii) at least one close confidante, including family member, non-related friends or child(ren); (iv) regular participation in a civic organization; and (v) deep religious faith and involvement with church.

Multiple Boolean statements and individual response conditions operationalize the IGLH, summarized in an abstracted chronological chart (see again Table 3). Associated with the chart are vectors, β, whose components are variables selected to represent life histories. These vectors contain fewer components than the raw response vectors used to write narrative biographies. However, they still require distillation to define parsimonious pathways to resilience. Step 2 thus illustrates the vital intersection between pondering the raw data of individual lives (generated by the computer) and preliminary scientific decision-making (the thinking scientist) about initial classes of common variables within groups that might plausibly explain a given outcome (depression and recovery from it—i.e., resilience). At this step we underscore the importance of scientific exchange among multiple collaborators, given that each may perceive somewhat different "stories" in the raw data. This kind of joint decision-making is recognized as fundamental to guiding patient management strategies in clinical medicine. We advocate its utility among survey researchers as well, to guard against the threat of a single perspective dominating decision-making at critical choice points.

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 interpretive 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. Such principles are essential for blocking of variables and ultimate interpretation of parsimonious histories for a given outcome.

This 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

TABLE 3
Abstracted 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 and at least 2 acute negative events} OR {1st episode of depression after age 36 and 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 AND ADVANTAGE AND ASPIRATIONS	Parents indifferent to college 1st job or college plans matched HS peers HS marital plans influenced job/college decisions	OR	Parents indifferent to college 1st job or college decision matched HS peers HS marital plans influenced college or job decision	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		Father's occupation is low/medium SEI	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 confidante [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		At least 3 siblings Intact family [2]	{Married only once} OR {At most 1 separation, divorce [1] and remarriage [2],[3]}

Note: Numbers in brackets [ ] refer to other organizing principles that simultaneously utilize the same item.

are examined, the result is a proposed vector of variables $\alpha = (\alpha_1, \ldots \alpha_n)$ that will define the ultimate class of life-history representations, referred to as admissible chronological representations (AACRs) that correspond to 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 an example based on the 17 variables derived in this step and listed in Table 4). It is important to note that entries in α are often Boolean statements defining *composite variables*, 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 exploratory data analytic software *because of the necessary interface* with the extant scientific knowledge base.

Step 3 thus crystallizes the essential life-history ingredients that define the ultimate set of pathways to the designated outcome. It is here that the maximal work of distillation occurs—in this instance, going from roughly 70 variables that comprised the β-vectors down to the 17 variables (some representing complex composites) that comprise the α vectors. The guiding objective is to achieve a set of life-history ingredients that are not so stripped down as to preclude the portrayal of individual variation, but also not so idiosyncratic as to prevent the characterization of group profiles. The reduction process combines the examination of computer-generated data for the full subgroup (looking for features of life histories that are likely candidates for deletion because of low frequency of occurrence and judged inconsequential nature) *and* consideration of insights from prior research and theory that might argue for the inclusion of particular variables. Again, it is a process of vital interchange between the decision-making scientist and computer-generated frequency counts of life histories with particular features.

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 more in-depth substantive illustration. The same generic progression of analytic steps, however, applies to the three remaining subgroups in our typology (i.e., depressed, vulnerable, and healthy).

Step 3 resulted in the identification of 17 components of AACRs that 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 num-

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

Age < 18	Age 18–36	Age 36–54	Age 54+
a_1 High school grades	a_6 At least 4 of 5 social relationship conditions:		
a_2 I.Q.	(i) Regular visits with friends in 1975 and 1992		
a_3 Parental education	(ii) At least one close confidant		
a_4 Alcohol problems at home	(iii) Participation in civic organizations, 1975 and 1992		
a_{12} Intact Family	(iv) Reports being "very close" with spouse		
	(v) Regular participant in religious organization/church		
	a_7 Started first job by age 26, and has no more than one involuntary job termination.		
	a_8 Upward career mobility, 1975 to 1992 measured by change in occupational status.		
	a_9 Supervisory status in 1975 and 1992 jobs, or increase in supervisory duties, 1975–1992.		
	a_{10} Stressful work conditions		a_5 Compares self favorably to parent, sibling, in terms of work, education, or finances
	a_{13} Live(d) with problem drinker		
	a_{14} Divorced with child(ren)		a_{11} Chronic health problems
	a_{15} Providing care to ill relative or friend		
		a_{16} Physical health worse than 10 years ago	
	a_{17} Involuntary spell of unemployment lasting six months or longer		

ber of 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 multiway table.

The analytic task at this point remains that of balancing the richness and texture of individual lives with the need to simplify the variability into more parsimonious summaries. We reduce the complexity by focusing on subgroups of variation within the resilient women. Thus, we organize the 17 components in various combinations to 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. 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*—i.e., [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—i.e., [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 $k = 4, 5, \ldots$ etc. until the largest value of k for which the highest frequency cell has at least 20 persons. For the subgroup $\mathbf{H}_1$, the process stopped at $k = 7$ yielding the 7-component logical AND statement defined by the conditions summarized (in Boolean form) in Appendix B. Interpretation of this AND statement in the context of whole lives is facilitated by the following narrative.

For the resilient women, a subgroup of 26 women (15.5 percent of the 168 women) was identified with a partial history comprised of six circumstances: (i) neither parent is a high school graduate; (ii) no chronic al-

coholism 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. Together, these life-history components tell a largely positive story—i.e., one indicating 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 percent 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.

Given this array of advantages, how do we explain 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 percent 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, 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 20 percent of the full group of resilient women. What about the remaining 80 percent? To explicate their life histories, we repeat the above steps (i.e., generate frequency counts of co-occurring conditions that string together partial histories). Thus, eliminating the $\mathbf{H}_1$ subgroup from the sample, we searched for the longest possible AND statements to characterize a second distinctive subgroup. This strategy alone did not produce another meaningful subgroup, suggesting that the Boolean statements needed to include both AND and somewhat more complex OR statements (the latter allowing for substitutability of conditions). Subgroup identification at this point thus becomes an interactive pro-

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

cess 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 $\mathbf{H}_2$, $\mathbf{H}_3$, and $\mathbf{H}_4$ are provided in Appendix B. Narrative descriptions are summarized below.

The second major subgroup, $\mathbf{H}_2$, 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 percent) 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): (1) social relationships (i.e., regular visits with friends, close confidant, close with spouse, participation in civic or religious groups); (2) first employment by age 26 and, at most, only 1 involuntary job termination; (3) stable or upward occupational status from age 35 to 54; (4) saw themselves as comparing favorably with 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, $\mathbf{H}_3$, 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 percent 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: (1) less than four of five positive social relationship conditions (see $\mathbf{a}_6$ of Table 4); (2) downward occupational mobility; (3) more than one spell of involuntary job termination; (4) divorced and raising one or more children; (5) caring for an ill person; (6) 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 that 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: (1) more than one spell of involuntary job termination; (2) downward SEI job mobility; (3) lived with an alcoholic during adulthood; (4) divorced and raising one or more children; (5) 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 points to *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 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

Tests of Distinguishability, by Mental Health Subgroup and Category of History

Category of History	Resilient	Depressed	Vulnerable	Healthy
$\mathbf{H_1}$	**.155**	**.098**	**.190**	**.197**
	(26)	**(6)**	**(23)**	**(176)**
$\mathbf{H_1}$ and ≥3 acute conditions	.346	.500	.130	.176
	(9)	(3)	(3)	(31)
$\mathbf{H_1}$ and ≥2 acute conditions before age 40	.307	0*	.130	.159
	(8)	(0)	(3)	(28)
$\mathbf{H_1}$ and top 1/3 of H.S. grades and IQ rankings	.846	.50	.565	.443*
	(22)	(3)	(13)	(78)
$\mathbf{H_2}$	**.285**	**.295**	**.140***	**.211**
	(48)	**(18)**	**(17)**	**(189)**
$\mathbf{H_2}$ and ≥3 acute conditions	.645	.278	.647	.343*
	(31)	(5)	(11)	(65)
$\mathbf{H_2}$ and ≥2 acute conditions before age 40	.333	.111	.411	.269
	(16)	(2)	(7)	(51)
$\mathbf{H_2}$ and top 1/3 of H.S. grades and IQ rankings	.688	.166*	.412	.540
	(33)	(3)	(7)	(102)
$\mathbf{H_3}$	**.208**	**.180**	**.173**	**.190**
	(35)	**(11)**	**(21)**	**(173)**
$\mathbf{H_3}$ and ≥3 acute conditions	.514	.545	.429	.317
	(18)	(6)	(9)	(155)
$\mathbf{H_3}$ and ≥2 acute conditions before age 40	.286	.545	.238	.219
	(10)	(6)	(5)	(38)
$\mathbf{H_3}$ and top 1/3 of H.S. grades and IQ rankings	.743	.545	.571	.647
	(26)	(6)	(12)	(112)
$\mathbf{H_4}$	**.345**	**.393**	**.487**	**.323**
	(58)	**(24)**	**(59)**	**(288)**
$\mathbf{H_4}$ and ≥3 acute conditions	.50	.417	.237*	.281*
	(29)	(10)	(14)	(81)
$\mathbf{H_4}$ and ≥2 acute conditions before age 40	.276	.083	.135	.204
	(16)	(2)	(8)	(59)
$\mathbf{H_4}$ and top 1/3 of H.S. grades and IQ rankings	.448	.542	.407	.486
	(26)	(13)	(24)	(140)

Note: The first row (**bold**) in each section indicates the proportion of individuals in each mental health group that possess the life history summarized by the $\mathbf{H_1} - \mathbf{H_4}$ Boolean statements. Numbers in parentheses beneath each proportion signify number of women within the mental health group who belong to that category of history.

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: 218–19, 238).

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 168 resilient women (or 15.5 percent) 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. They are, nevertheless, fundamental to a full understanding of the life histories of resilient women. It is difficult to add these events in generating the life-history pathways because of the idiosyncratic nature of the type, timing, and sequencing of these events. What is tractable, however, is the *cumulative number of acute events*, which differentiated between those occurring prior to age 40 and those occurring through age 50. This temporal distinction was based on empirical observation about the age distribution of acute events—some individuals have a substantial number of events prior to age 40, while for others there was a cluster of events after age 40. Not surprisingly, there is variation in frequencies of these cumulative counts across the pathways $\mathbf{H}_1 - \mathbf{H}_4$.

A second augmentation to our pathway summaries was the ability variable (composite of class standing and IQ). This variable is in the original set of 17 summary variables extracted at Step 3 for the representation of individual life-history pathways. However, the variable had not shown sufficiently high concentration within any particular subgroup to emerge in one of the four pathways (although 22 of the 26 women in $\mathbf{H}_1$ met this criterion). Thus, we chose to augment the representations for each group by this variable and also use it in assessments of distinguishability.

In combination, the supplemented Boolean statements include *all* of the information in the components of AACRs. The values within Table 5 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 $\mathbf{H}_1$ 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, $\mathbf{H}_1$, show that with just the Boolean summary these women are not distinguished from any of the other mental health subgroups. However, when two or more acute events before the age of 40 were added (for a majority, one acute event was death of a parent), this subgroup of Resilient women was distinguished from the lives of the Depressed subgroup. When ability assessments (i.e., being in the top third of IQ and high school grades) were added to the original Boolean statement, these women were also distinguished from the Healthy group. Nothing in these analyses distinguished this Resilient subgroup from the Vulnerable.

The second subgroup of Resilient women, $\mathbf{H}_2$, is distinguishable from the Vulnerable when comparisons are made with only the basic Boolean summary statement. However, the addition of 3 or more acute events in the lives of these women further distinguishes them from the Healthy. 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, $\mathbf{H}_3$, shows no distinguishability from the other mental health groups across the differing combinations of the Boolean summary with acute events, temporal organization of acute events before age 40, or ability assessments.

Finally, the $\mathbf{H}_4$ 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 differentiates this group of Resilient women from the Vulnerable and the Healthy. Nothing in these analyses distinguished these women from the Depressed.

In sum, the preceding tests of distinguishability reveal that the life histories of the four subgroups of resilient women showed mixed distinctiveness from other mental health groups. Only for the second subgroup was discrimination obtained from all other mental health groups. For the first and last subgroups, distinguishability was evident for two of the three remaining mental health groups. In one instance, uniqueness was evident at the level of the initial pathway representation, while for others it was the pathway representation combined with the high prevalence of acute events, the timing of these events, or the personal ability profiles. For the third subgroup, no significant tests of distinguishability were obtained. It is important to note that whether or not initial pathway representations formalized by Boolean statements discriminate among outcome groups is decidedly dataset and problem dependent. For example, in Zhao's (1997) study of the pathways to resilience among children, using the National Longitudinal Survey of Youth

(NLSY), sharp distinguishability occurred with initial pathway representations. Zhao's study employed our methodology throughout.

In reviewing the mixed evidence for distinguishability, it is important to remember that these analyses do not address what life-history patterns predominate in the other mental health groups. An answer to this question 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 most 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.

Two final methodological points require clarification. First, we used a very small subsample (<3 percent) of the total sample to construct narratives. This allowed us to compare whole lives within each mental health group and across groups. The across-group comparisons provided a preliminary assessment of whether or not there are differences among these lives and on what features. Because of the small number of cases involved, including them in assessments of distinguishability in Step 5 did not alter the conclusions.

Second, we are mindful that none of the original variables or the 17-component AACRs is 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 some of the original variables 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.

5. DISCUSSION

We have introduced a new strategy for the analysis of longitudinal survey data that takes the full individual history as the unit of analysis. The principal and novel features of the strategy are as follows:

1. It includes the writing of narratives at the beginning and terminal stages of the analysis of survey data.

2. It is person-, not variable-, centered.
3. It produces pathways representing aggregates of individual life histories.
4. It works simultaneously across multiple life domains.
5. It is capable of identifying multiple pathways to a given outcome.
6. It systematizes the decision-making en route to delineation of the pathways.
7. It tests hypotheses about whole lives that are the integration of what is typically studied as separate pieces.

Point (1) underscores the importance of examining whole lives in story form as a means of comprehending the volume of detail that necessarily comprises human lives. Although point (2) is a clear objective in much of the life-history literature (Brooks-Gunn, Phelps, and Elder 1991; Clausen 1993; Elder 1974, 1985; Magnusson and Bergman 1990) the lack of person-centered methodological tools has prevented investigators from proceeding to point (3). Attempts to get at aggregates have typically involved the use of variable-centered techniques, since these were available. However, the investigators mentioned above and many others were well aware that the lack of preservation of individuals as units of analysis severely limited the inferences they could draw about the dynamics of individual (or aggregate of individuals) change. Point (4) is conventionally dealt with, if at all, by variable-centered techniques. The present strategy is, to our knowledge, the first incorporation of multiple life domain information in a process of aggregation of whole life representations. Investigators such as Harris, Brown, and Bifulco (1990) and Magnusson and Bergman (1990) have struggled with point (5); however, the absence of tools for aggregating whole life representations has prevented their delineating full pathways. Harris et al. (1990) set forth a template of several pathways to depression, and Magnusson and Bergman (1990) looked for "patterns" connecting childhood problems with adult maladjustment. Nevertheless, their variable-centered empirical analyses (using logistic regression with interaction terms in the former, and cluster analysis in the latter) did not achieve the desired objective. What was needed was a *person-centered methodology*. Point (6) emphasizes the critical role of scientific judgment embedded in the progression of methodological steps, something that is an essential part of any data analysis, but is infrequently reported. Finally, point (7) carries hypothesis-testing into the uncharted territory of whole lives.

Our methodology rests on a labor-intensive series of mind-machine interactions and raises the question of the extent to which the process of discovery of multiple pathways might be more automated. With the exception of optimal matching (Abbott 1992; Abbott and Hrycak 1990), and to some extent the Boolean algebraic methods (Qualitative Comparative Analysis, QCA) of Ragin (1987), virtually none of the extant statistical methodologies is person-centered. This weakness in longitudinal methodology has been lucidly described by Mishler (1997) and Abbott (1992). To clarify the issues, we briefly elaborate the difficulties associated with some variable-centered methods that might be viewed as candidates for automating one or more of our steps to pathway representations.

Recursive partitioning classification, or Classification and Regression Trees (CART) (Breiman et al. 1984; Zhang et al., 1996) could be considered as an automated procedure for starting with all 250+ variables on all of the respondents in our mental health categories: Healthy, Vulnerable, Resilient, and Depressed. The objective would be to generate output trees that maximize our ability to predict membership in these categories, each identified with terminal nodes on a tree. Each pathway down the tree ending in a given terminal node corresponds to a logical AND statement incorporating information from variables across multiple life domains. Two or more pathways into the same terminal node or multiple terminal nodes each associated with the same outcome, would be identified with an OR statement. In running the CART software, limits can be imposed on the maximal number of levels in the output tree allowed prior to the terminal nodes.

The *judgment* of the scientist is required to determine whether all pathways to the nodes identified with a given outcome should be summarized by a single complex Boolean expression, or partitioned into two or more sets of pathways defining qualitatively different kinds of histories. Comparison of sets of pathways within and between terminal nodes can be carried out via the multiple comparison strategy we employed in Step 5.

This large computational exercise—250+ variables for approximately 1200 individuals—can, in principle, be carried out. The performance criteria and splitting rules in CART are, however, not constrained by substantive knowledge from any field of scientific inquiry (e.g., the guiding principles that opened our life-history inquiry). Thus, the pathways down the best-predictive trees are not necessarily interpretable within the knowledge of a given field. This disjunction between statistical performance criteria, based solely on numerical goodness-of-fit, and con-

straints on the tree structure and splitting rules derived from extant scientific knowledge, have proven problematic in past applications of CART. Levy et al. (1981; 1985), for example, applied CART to neurological assessments of comatose patients to predict which patients were likely to recover with moderate disabilities as opposed to remaining vegetative or dying within a year of hospital admission. The numerically best predictive trees were virtually *never* neurologically interpretable. Rather, inspection of 20+ nearly optimal trees led to selection, based on scientific judgment (the mind interacting with the machine), of a prognostic tree that had interpretable pathways.

To automate this decision-making step requires that the goodness-of-fit criterion of the overall model and a set of allowable splits (i.e., a priori constraints on the set of allowable pathways) be defined *in advance* by neurology subject matter. Our own labor-intensive inspection of the life-history data led to generation of composite variables (e.g., three out of five conditions of a given type must occur), which could *not* be discovered with CART without extensive a priori constraints on higher order splits. These constraining processes represent difficult and uncharted areas in the marriage of analytical tools such as CART to scientific domains in which they might provide further automation of the process of discovery. Accordingly, we do not see fully automated discovery strategies—even in the spirit of the artificial intelligence literature (Holland et al. 1989)—as the methodology of choice for the characterization of life histories.

Other variable-centered methods such as measurement and structural equation models allow for the examination of the direct and indirect effects of multiple indicators simultaneously, although the higher-order interaction terms needed to capture the interdependent effects integral to a "whole life" approach would lead to unstable parameter estimates. Alternatively, event-history analysis allows researchers to describe life events and pinpoint the causes and timing of transitions or life change (e.g., to determine the probability and predictors of divorce, remarriage, job terminations) (Allison 1984; Flinn and Heckman 1982), but again the higher-order interactions needed to characterize complex, cross-domain experience lead to parameter instability. It might be argued 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 sensitive tools for this purpose.

Another problem with event-history models, as representative of broader classes of stochastic process models, is that they place an inappropriate emphasis on something thought of as a typical, or average, trajectory. This simply eliminates the individual history as the unit of analysis. The fluctuations about typical trajectories that are incorporated in stochastic process specifications are accounted for in two ways: (1) latent processes interpreted within a sharply delineated theory and built into the model, or (2) disturbance/error processes for which, in the problems we are treating, there is scant substantive basis for their specification.

Returning to our emphasis on person-oriented methods and the question of automation, it is useful to consider why we did not use optimal matching (Abbott 1992; Abbott and Hrycak 1990). The technique of optimal matching has been effectively utilized with single life domains, rather than the multiple simultaneous domains central to our focus. Optimal matching requires the specification of a metric that scores numerical distances between different sets of histories (pathways). The task of developing a metric on the multidimensional space encompassed by many life domains and experiences through time would be exceedingly difficult. Indeed, the strategy that we employ would probably be an essential preamble to specification of the ultimate metric. This underscores the extensiveness of *judgments* that pervade even optimal matching.

In Abbott and Hrycak's work there is extensive preliminary examination of detailed data to decide what to use in the subsequent optimal matching procedure. They refer to the "major coding decisions" that had to be made, and the judgments that were involved in the selection of 34 variables out of more than 3 times that number (Abbott and Hrycak 1990:158–59). Thus, utilization of optimal matching would have accomplished nothing regarding a reduction of the degree to which judgments were a fundamental part of our enterprise. Lacking a rationale for making the fine distinctions necessary to specify a metric on high dimensional space, it is clearly preferable to *delineate* the decisions made enroute to pathway representations. This is accomplished by our proposed strategy.

More recently, Abbott and Barman (1997) describe a strategy to discover small regularities embedded in longer sequences of data, using the LEA algorithm (Lawrence et al. 1993). The strategy allows for variation in points of initiation in subsequences as well as for separation of parts of a subsequence by long segments of highly stable or irregular patterns. Such features are important in the context of rhetorical analysis, where the strategy is applied, but this methodology is simply unnecessary to discern

regularities embedded in longer sequences of our life-history data. For example, we looked for and used turning points in occupational or supervisory status data to define key variables (e.g., $\mathbf{a}_8$ and $\mathbf{a}_9$). These shifts illustrate small regularities embedded in longer work-life sequences, as would marital or parental status changes in family-life sequences. Such turning points are readily evident from simple direct examination of short substrings of responses from different life domains—more discerning procedures for their detection are not required.

Considering other automated alternatives, it might seem reasonable to use Qualitative Comparative Analysis (QCA) (Ragin 1987) at Step 4 in our strategy. The primary aim at this stage is to identify subgroups, or distinct pathways, within a given mental health group. Our procedures differ significantly from QCA in the creation of such subgroups. Specifically, QCA treats all possible conjunctive (AND) and disjunctive (OR) statements as equally viable, whereas we privilege *a priori* conjunctive statements. Why? The central reason is that a long AND statement common to many individuals provides a more parsimonious *interpretation* of life histories. With seven or eight components, meaningfully linked to the organizing principles, such a conjunctive statement provides the most direct connection to the 17-component AND statements where subgroup analysis begins. Moreover, because all such individuals share *all of the features specified*, their life histories can be told as a *single story*.

When the data do not support pure conjunctions, as was the case in generating our second subgroup, $\mathbf{H}_2$, we then privilege *restricted classes of disjunctions*. The basis for restriction is the prior theory and organizing principles relevant to the problem at hand (i.e., resilience). For example, $\mathbf{H}_2$ was defined by a conjunction of severe adversity in childhood (growing up with an alcoholic parent) and a disjunction of four sources of compensating support. The latter reflected our interest in identifying sources of cumulative advantage that could overcome severe childhood adversity and thereby define a pathway to resilience. In short, we were not interested in all possible disjunctive statements, but particularly those that help identify routes out of a difficult childhood.

It is important to add that QCA subgroup analyses offer no escape from subjective judgmental processes. Ragin's (1987) discussion of a reduced Boolean equation generated in the analysis of juvenile courts underscores this point:

> The Boolean analysis presented above is not entirely satisfactory from a minimization point of view because of

> the overlap, conceptual and empirical, that exists among the first three types. Furthermore, the analysis also falls short from the perspective of substantive interests because it fails to delineate a coherent traditional type. These shortcomings suggest that the analysis is too fine-grained because far too many types are delineated relative to theoretical explanations (Ragin 1987:157).

To produce a less fine-grained Boolean analysis, Ragin suggests altering the frequency criterion used to define "substantively important clusters." This is sound advice for how to evaluate, and possibly redo, the QCA analysis. It rests entirely on judgments from knowledge of the domain in which the analysis is conducted. Our sequential strategy focused first on conjunctions, followed by privileged disjunctions, simply reveals a preference for invoking inescapable judgmental processes earlier in the process—that is, in subgroup formation rather than subgroup evaluation and/or reconstruction at the end of the analysis.

Those who would prefer automated methods to identify subgroups at Step 4 might also consider Q-mode factor analysis, which is employed to generate "types" of persons (e.g., York and John 1992). We explored this option and discovered that (1) 14 principal factors were identified; (2) only two of these met our minimum size criterion (i.e., $N \geq 20$), with sizes of $n = 77$ and $n = 31$; (3) five factors (including the above two) defined groups of people who were members of only one group; additional groups had sizes of $n = 12$, $n = 2$, $n = 2$ and altogether the five groups encompassed 124 people; (4) the remaining 44 people comprised a residual category.

The real difficulty with Q factor analysis comes with interpretation. Each of the two largest groups contains persons from all four of the subgroups identified by our sequential strategy (i.e., conjunctives first, followed by privileged disjunctives). These qualitatively different pathways within distinct factors of the Q-mode analysis show the difficulty of cleanly interpreting the two principal groups. That meaningful portraits of how resilience comes about were not provided emphasizes the critical role of using subject-matter-based judgment throughout the process of defining subgroups.

As a final methodological consideration, we might entertain using Griffin's (1993) event structure analysis (ESA) on narratives developed from the full set of 168 resilient women. ESA is a highly judgmental process for organizing the information about whole lives and thus may appear suitable for our purposes. However, the main difficulty is that ESA is too

labor intensive for large data sets; it can be used only with a small number of cases involving a modest number of variables. For example, in Griffin's analysis of lynchings, the work was based on roughly 25 variables from 7 cases (Griffin 1993:1125, note 17). In contrast, we began with over 250 variables and 168 cases. Moreover, analyses of the other mental health groups involve even larger numbers of cases on the same number of variables (e.g., there are 826 cases of mentally healthy women). Griffin's methodology is simply out of bounds for this size data set/sample. Nevertheless, it is important to note that we are, in effect, doing ESA in our Steps 1 and 2, where we try to get a sense of what variables to carry forward with the larger sample to characterize the life histories of all 168 women.

Apart from methodological alternatives, it is also important to consider what new substantive findings emerge from these life-history analyses. While a comprehensive review of prior resilience research is beyond the purview of this work, we note key advances following from our inquiry. First, our investigation employs a more rigorous definition of resilience than studies emphasizing the "absence of illness" outcomes in the face of adversity (Garmezy 1991, 1993a; Garmezy, Masten, and Tellegen 1984; Rutter 1987, 1990; Werner 1995; Werner and Smith 1992). Resilience in our framework requires that people demonstrate the "presence of wellness" and the capacity to thrive following life difficulties (Ryff and Singer, 1998; Ryff, Singer, Love, and Essex, forthcoming). Second, with this study, we emphasize the *recovery* features of resilience—that is, the regaining of positive psychological functioning following depression. Third, most of the prior work cited above has addressed resilience in childhood; little empirical work has addressed the prevalence or processes of resilience in adulthood (see Klohnen 1996). Fourth, our person-centered methodology provides a significant advance over prior findings. Numerous factors have been identified to account for stress resistance in children exposed to difficult life circumstances (e.g., parental psychopathology, serious caregiving deficits, chronic poverty, war). These include temperament and personality attributes, family cohesion and warmth, social supports, high IQ, problem-solving abilities, high SES. Our life-course approach broadens the array of factors that comprise sources of adversity (e.g., job loss, living with an alcoholic spouse, caregiving) *and* advantage (e.g., educational attainment, occupational mobility, religion, community involvement) in people's lives.

Most importantly, we put these factors together in a way that allows for understanding of *whole lives*, whereas prior findings, generated by traditional nomothetic analyses, show that protective factors decrease the

risk for psychological disorders generally but do *not* convey how particular forms of adversity are combined with particular kinds of advantage. These *distinct pathways to resilience* are the essence of our goal of mapping the neglected territory between idiographic and nomothetic analyses. Such refined understanding advances knowledge of how resilience comes about and is actually lived, but it also has potentially powerful clinical import for identifying diverse compensating advantages that can offset particular types of adversity.

In following our illustrative analysis of resilient women in the WLS, it is important to keep in mind that our methodological strategy is not restricted to this application. Zhao (1997), as noted earlier, used it to characterize life histories of children in disadvantaged environments, with sharp distinguishability between resilient and vulnerable groups in first-level comparison of pathways. Other major longitudinal surveys where our person-oriented life-history strategy would be particularly pertinent are the Berkeley and Oakland studies (e.g., Clausen 1993; Elder 1974), Terman's study of gifted children (Holahan and Sears 1995), and Werner's study of resilient children in Hawaii (Werner and Smith 1992).

Going beyond the context of life-history research, Acevedo-Garcia (1996) demonstrated the applicability of our strategy to large cross-sectional data sets. In her case, the objective was to characterize the risk of tuberculosis for individuals, or aggregates of similar individuals. Level of risk was represented as a complex profile of behavioral and biological conditions, coupled to a characterization of the physical environment. The profile replaced the life history as the focus of analysis. However, profiles were formally specified by complex Boolean statements whose full scope was ultimately communicated by narratives.

Finally, we stress that our efforts to understand the life histories of the resilient have benefitted from a series of *vital dialectics*. Constructive, if not essential, tensions are generated by movement back and forth between finely nuanced details of individual lives and thinner, less textured summaries of groups of lives. Rather than cast allegiance to an exclusively idiographic or nomothetic approach, we have tried to work in the territory between these two levels. We have pointed out the vitality that comes from working with qualitative narratives and quantitative information, both derived from structured survey data. 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 ideas about how experience cu-

mulates 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. Lastly, 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 parallel by the mind) and the capacities of multivariate models to integrate high dimensional numerical data. Our analytic steps thus involved continuous interplay between the mind and the machine, narratives and numbers, all of which are essential to the task of understanding human lives.

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

Age ≦ 18	18 < Age < 54	Age 54+
—Grew up in intact family —Did not live with a problem drinker in the childhood home —Neither parent is a H.S. graduate —High school grades in top 33% —IQ score in top 33%	—Strong social support network: —Has a close confidant —Had frequent visits with friends over time —Regular participant in religious organization(s)/church —Regular participation in civic and community organizations —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	—Describes self as doing better than sibling in terms of finances, and similar in terms of work and education —One chronic health problem —Physical health is somewhat worse than it was ten years ago

(*continued*)

Part 1 continued.

Age ≦ 18	18 < Age < 54	Age 54+
	—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	

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 $\mathbf{H}_1$ 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

$$\bigwedge_{k=1}^{17} [a_k = 1_k] \wedge [\text{death of mother when respondent is 52}] \wedge [\text{death of father when respondent is 52}] \wedge [\text{first and worst episode of depression when respondent is 51}],^{8}$$

[8]The symbol $\wedge$ denotes the AND operation. If A and B are labels for two conditions, then $A \wedge B$ means that both of these conditions occur. The symbol $\bigwedge_{k=1}^{17}$ denotes an AND operation involving 17 consecutive conditions.

where the levels $l_1, \ldots l_{17}$ for the variables $a_1, \ldots a_{17}$ are

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

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 $A \wedge B = [a_3 = 0] \wedge [a_4 = 0]$ = {[neither parent is a HS graduate] AND [no alcohol in the childhood home]}.

If $A_1, A_2, \ldots, A_K$ 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, $A_3, A_4, \ldots, A_8$, 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 $A_3, A_4, \ldots, A_8$ 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, $\mathbf{H}_1 - H_4$, may be represented as:

$$\mathbf{H}_1: \bigwedge_{k=3}^{5} [a_k = 0] \wedge \bigwedge_{k=7}^{8} [a_k = 0] \wedge \bigwedge_{k=13}^{14} [a_k = 0]$$

$$\mathbf{H}_2: [a_4 = 1] \wedge \bigvee_{k=5}^{8} [a_k = 0]$$

$$\mathbf{H}_3\colon [a_3 = 1] \wedge [a_4 = 0] \wedge \left\{ \bigvee_{k=5}^{8} [a_k \neq 0] \vee \bigvee_{k=14}^{15} [a_k \neq 0] \right\}$$

$$\mathbf{H}_4\colon [a_3 = 0] \wedge [a_4 = 0] \wedge \left\{ [a_5 \neq 0] \vee \bigvee_{k=7}^{8} [a_k \neq 0] \vee \bigvee_{k=13}^{14} [a_k \neq 0] \right\}$$

Part 2: Description of Concentration Measure

The search strategy that identified the seven-component AND statement characterizing $\mathbf{H}_1$ utilized a measure of concentration of the counts in each of the subtables 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 $n_{l_1}^{(\sigma)}, \ldots, = n_{l_J}^{(\sigma)}$ = number of individuals with the particular response vector $(l_1, \ldots, l_J)$ based on the particular set, σ, of J variables. Observe that there are $\binom{K}{J} = \dfrac{K!}{J!(K-J)!}$ sets of J variables. Let N = number of individuals in the population whose histories are to be characterized ($N = 168$ for resilient women). Set $\mathbb{C}_\sigma$ = 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 $\mathbb{C}_\sigma = L_1^{(\sigma)} L_2^{(\sigma)} \ldots L_J^{(\sigma)}$. For a particular set, σ, of J variables, define the *concentration* of the realized response set as

$$[\mathrm{CON}]_J^{(\sigma)} = \frac{\mathbb{C}_\sigma}{\mathbb{C}_{\sigma-1}} \left[1 - \max_{(l_j^{(\sigma)})} \frac{n_{l_j^{(\sigma)}}}{N} \right] \text{ if } \mathbb{C}_\sigma \leq N$$

$$\frac{N}{N-1} \left[1 - \max_{(l_j^{(\sigma)})} \frac{n_{l_j^{(\sigma)}}}{N} \right] \text{ if } \mathbb{C}_\sigma > N.$$

Then if $\mathbf{J}$ = set of $\binom{K}{J}$ collections of J variables define $\min_{\sigma \in \mathbf{J}} [\mathrm{CON}]_J^{(\sigma)}$ and $1_J^{(-)}$ = response vector (modal cell) for which $\min_{\sigma \in \mathbf{J}} [\mathrm{CON}]_J^{(\sigma)}$ is attained. $[\mathrm{CON}]_J^{(\sigma)}$ and the response vector for which it is attained represent the most frequently co-occurring conditions in the variable set, σ. The pair $\min_{\sigma \in \mathbf{J}} [\mathrm{CON}]_J^{(\sigma)}, 1_J^{(-)}$ identifies the maximally concentrated set of J response vectors and the corresponding set of modal co-occurring conditions $l_J^{(-)}$. The extreme cases occur when $[\mathrm{CON}]_J^{(\sigma)} = 0$, in which case all observations are in one cell, and when $[\mathrm{CON}]_J^{(\sigma)} = 1$, in which case observations are equally distributed among all cells. $[\mathrm{CON}]_J^{(\sigma)}$ 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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