

---

## THE LONG ARM OF CHILDHOOD: THE INFLUENCE OF EARLY-LIFE SOCIAL CONDITIONS ON MEN'S MORTALITY\*

MARK D. HAYWARD AND BRIDGET K. GORMAN

*Increasingly, social scientists are turning to childhood to gain a better understanding of the fundamental social causes of adult mortality. However, evidence of the link between childhood and the mortality of adults is fragmentary, and the intervening mechanisms remain unclear. Drawing on the National Longitudinal Survey of Older Men, our analysis shows that men's mortality is associated with an array of childhood conditions, including socioeconomic status, family living arrangements, mother's work status, rural residence, and parents' nativity. With the exception of parental nativity, socioeconomic-achievement processes in adulthood and lifestyle factors mediated these associations. Education, family income, household wealth, and occupation mediated the influence of socioeconomic status in childhood. Adult lifestyle factors, particularly body mass, mediated the effects of family living arrangements in childhood, mother's work status, and rural residence. Our findings bring into sharp focus the idea that economic and educational policies that are targeted at children's well-being are implicitly health policies with effects that reach far into the adult life course.*

**S**ocioeconomic disparities in mortality are a stark indictment of differences in persons' ability to invest in work careers, families, and social relationships and to reap the health benefits of these investments. These inequities persist in the face of economic development and social welfare programs, and there is evidence that they are widening (for a review of the literature, see Preston and Taubman 1994). Moreover, socioeconomic disparities in mortality in the United States parallel European patterns (Shaw et al. 2000; Wilkinson 1996), emphasizing the pervasiveness of socioeconomic disparities in mortality and the role of socioeconomic status (SES) as a fundamental cause of disease (Link and Phelan 1995).

Increasingly, researchers are turning to a life-course approach to understand the socioeconomic origins of adult mortality. Because of its chronic-disease causes, adult mortality is the long-term outcome of a range of childhood conditions and experiences, beginning in utero, combined with the cumulative "insults" experienced during adulthood (Blackwell, Hayward, and Crimmins 2001; Elo and Preston 1992; Hayward et al. 2000; Kuh and Ben-Shlomo 1997; Preston, Hill, and Drevenstedt 1998). Recent research has pointed to a number of early life conditions that have far-reaching associations with a range of chronic conditions (Blackwell et al. 2001; Elo and Preston 1992; Kuh and Ben-Shlomo 1997). These conditions include exposure to adverse conditions in utero, infectious diseases and environmental toxins, nutritional deficits, childhood poverty, and stressful family conditions.

---

\*Mark D. Hayward, Population Research Institute and Department of Sociology, Penn State University. Bridget K. Gorman, Department of Sociology, Rice University, and Behavioral Sciences, University of Texas School of Public Health. Direct correspondence to Mark D. Hayward, Population Research Institute, Penn State University, 601 Oswald Tower, University Park, PA 16802; E-mail: Hayward@pop.psu.edu. This research was partially supported by grants from the National Institute on Aging (R01 AG11758 and R55 AG09311) and the National Institute of Child Health and Human Development (1 R24 HD41025, 5 P30 HD28263, and T32 HD07168).

Although a life-course perspective promises to yield insights into disparities in adult mortality, the current understanding of these associations is fragmentary. Studies have frequently been based on nonrepresentative samples, the range of childhood conditions examined in a study is often constrained to a subset of potential predictors, and measures of adults' circumstances and behaviors are sometimes not available in historical demographic studies. These limitations inhibit our understanding of *how* childhood circumstances, and implicitly circumstances in adulthood, are associated with mortality. Some research has suggested that childhood circumstances have a "direct" association with the health of adults, in the sense that these circumstances permanently alter life chances. An example is physiological scarring that could occur with major bouts of childhood illness or psychosocial stress. Yet, childhood conditions potentially set in motion a range of cascading events (e.g., lifestyle preferences, exposure to adverse work conditions, and income and wealth trajectories) that can have more temporally proximate effects on mortality.

Our study contributes to an understanding of the associations between childhood circumstances and adult mortality in several ways. First, we took advantage of a nationally representative survey of American men aged 45–59 in 1966: the National Longitudinal Survey of Older Men (NLS). These men were followed for a 24-year period, providing us with population-based biographical information on socioeconomic achievement, lifestyle, and mortality. Second, the NLS contains measures of childhood circumstances that encompass theoretically important social origins of adult mortality: the family's socioeconomic circumstances, family structure, and residence in rural and urban communities. These measures allowed us to examine whether childhood circumstances have long-term associations with mortality, net of adults' socioeconomic achievement and lifestyles, or whether childhood circumstances are indirectly associated with mortality through adults' achievement and lifestyles. We also investigated the possible overestimation of effects of socioeconomic factors in adulthood in research on mortality for which information on childhood circumstances is not available.

### THE NATURE OF THE ASSOCIATIONS BETWEEN CHILDHOOD CONDITIONS AND ADULT MORTALITY

SES is frequently conceptualized in the literature on adult mortality without regard to changing circumstances during the life cycle, drawing on the Weberian conception of social position: class, status, and party. Preston and Taubman (1994) provided an excellent overview of the evidence on SES differences in morbidity and mortality. Although some attention has been given to the differential effects of socioeconomic conditions on health over the life cycle (e.g., Blackwell et al. 2001; Costa 1999; Elo and Preston 1992; Hayward, Pienta, and McLaughlin 1997; Moore and Hayward 1990; Preston et al. 1998), the more common approach assumes that SES is persistent and that the circumstances at the time of measurement (often only once) reflect one's position over a lifetime.

Recasting socioeconomic conditions and social conditions more generally in life-cycle terms provides a more cogent framework of the ways in which disparities in adult mortality arise. Childhood socioeconomic conditions and educational attainment, for example, shape preferences for the major lifestyle behaviors of smoking, drinking, diet, and physical activity (e.g., Brunner et al. 1996; Lynch, Kaplan, and Salonen 1997; Winkleby et al. 1992). Socioeconomic circumstances early in life also influence mortality via differential socialization toward risk taking, deferred gratification, and a sense of autonomy and control (Elo and Preston 1992). Characteristics of the home and peer environments differentiate exposure to health risks during gestation and childhood through exposure to ambient hazards, such as secondhand smoke, nutrition, and infectious disease, as well as through medical care (Barker 1998; Brunner et al. 1996; Gunnell et al. 1996; Kuh and Wadsworth 1993; Power and Peckham 1990). Parents' marital quality and divorce also have far-reaching effects by weakening adult offsprings' familial and

social ties, lowering socioeconomic achievement, and diminishing psychological well-being (Dahl and Birkelund 1997; Lundberg 1993, 1997). Thus, it is not surprising that there is growing evidence of an association between marital quality in the childhood home, divorce, and poor health in adulthood (Dahl and Birkelund 1997; Lundberg 1993, 1997; Schwartz et al. 1995).

With adulthood come additional factors that reinforce the bond between social conditions and adult mortality. Socioeconomic conditions in adulthood arise from achievement processes that were initiated in childhood and are tied to the resources of the family of origin. The family of origin possesses resources that can be used to generate future resources, including the education, income, and the occupational characteristics of household members (O'Rand 2001; Parcel and Menaghan 1994), and to promote socioeconomic achievement in adulthood among offspring via educational opportunities. During adulthood, the work career fashions income trajectories, exposure to stressful or hazardous working conditions, and access to health care through health insurance (Brunner et al. 1996; Marmot et al. 1997; Marmot and Shipley 1996). Income and wealth (or the lack of them) can be an important stressor, but they also provide the means to mitigate the effects of other stressors in the environment (Hayward et al. 1997). Stressful or hazardous working conditions can negatively affect health (Karasek 1990; Karasek, Thorell, and Schwartz 1988; Marmot et al. 1997; Marmot and Shipley 1996; Moore and Hayward 1990). And the lack of health insurance can discourage the use of medical care, particularly in the early and more treatable stages of a health problem (e.g., Rice and Winn 1990).

Our brief review illustrates the multifarious ways in which childhood conditions are tied to adult mortality. Preston et al. (1998) codified these associations in a parsimonious conceptual framework. Adverse childhood circumstances may influence adult mortality (1) directly and positively (e.g., a physiological "scarring" effect), (2) directly and negatively (an acquired immunity effect), (3) indirectly and positively (e.g., childhood SES gives rise to adult SES, which, in turn, is the primary cause of health in adulthood; childhood family relationships and interaction patterns may have consequences for psychosocial development), and (4) indirectly and negatively (i.e., a selection process in which children in adverse circumstances "escape" because they are unusually robust and hence survive to older ages).

Although the evidence is fragmentary, research has provided support for a number of these mechanisms. Adverse conditions in utero, diet and nutrition in childhood, and infectious diseases in early life, for example, appear to be directly and positively associated with health problems in adulthood in the sense that these adverse conditions trigger biological responses (e.g., damage to organ systems) that increase the risk of fatal chronic conditions. Childhood is a sensitive life-cycle period in which disruptions in biological development can have far-reaching negative consequences for health and mortality in adulthood (Kuh and Wadsworth 1993).<sup>1</sup> For example, infectious diseases in early life may increase the chances of heart disease through effects on the autoimmune complexes and the subsequent development of atherosclerotic lesions resulting in the accumulation of plaque in adulthood (Buck and Simpson 1982; Mathews, Whittingham, and Mackay 1974).

Some researchers have pointed to the possible *benefits* to the health of adults of adverse childhood circumstances. For example, individuals are more likely to survive some infectious diseases (e.g., smallpox) in childhood than in adulthood, and, in the event of survival, immunity is conferred (Alter, Oris, and Göran 2001). In addition, higher levels of infectious diseases early in life may increase autoimmune function and lower the

---

1. Childhood, although a sensitive period of the life cycle, can be differentiated from the in utero environment in the sense that the in utero environment represents a critical stage of development for the structure and function of a number of organ systems.

chances of autoimmune conditions, such as asthma (Paunio et al. 2000). At present, the bulk of evidence points to the adverse health consequences of childhood deprivation and illness, although this evidence probably reflects the relative frequency of chronic diseases in the population for which an acquired immunity effect does not play a role.

Owing to the paucity of studies that have included information on both childhood and adulthood conditions, the current understanding of the indirect routes by which childhood affects adult mortality is largely speculative (Preston et al. 1998). Adverse childhood circumstances may curtail adults' socioeconomic-achievement processes, self-esteem, and the ability to form social attachments—factors that are also associated with chronic health problems. Kuh and Wadsworth (1993), for example, observed that part of the association between an advantaged social background and better health at age 36 was due to greater social advantages in adulthood. However, they also reported that individuals with high levels of education and advantaged social-class backgrounds were in better health at age 36, *net* of their social class and living arrangements in adulthood. Thus, there is some evidence that both direct and indirect mechanisms come into play in linking childhood conditions with the health of adults. In a more recent study, Blackwell et al. (2001) reported that maternal education reduced a middle-aged person's chance of having diabetes even when the person's own education and wealth at midlife were controlled. Other reported associations, net of the adult SES measures and comorbid conditions, were (1) a lower probability of having cancer or cardiovascular disease among persons from nonintact families in which one or both parents were absent because of military service, financial reasons, or incarceration and (2) a higher probability of having arthritis among persons whose fathers were in low-status occupations. In general, these associations were robust when adult circumstances were controlled, although admittedly these are only rudimentary results, given the paucity of adult conditions considered in the model. Nonetheless, they suggest that part of the effect of childhood conditions is direct.

Studies that have found direct effects of childhood on adult mortality have also frequently reported direct effects of adult conditions. The pattern of results points to a life-cycle process in which adult conditions appear to combine with early life conditions to influence the health of adults (Kuh et al. 1997). That is, the health of adults appears to be the outcome of childhood circumstances *plus* adults' socioeconomic resources and lifestyles. This pattern of findings also parallels similar studies of the health of adults in which early-adult conditions have been shown to combine with later-life conditions (Costa 1999; Moore and Hayward 1990). Taken as a whole, the literature points to the possibility that adult mortality is the outcome of an additive process of exposure to adverse conditions. Although a person's life chances can be improved by socioeconomic success in adulthood, the ravages of childhood poverty may leave an indelible mark, even among those who have experienced socioeconomic success as adults. Yet, while largely untested, the possibility also exists that this process is interactive, rather than additive. Instead of social conditions in childhood and adulthood influencing mortality in an additive manner, it may be that childhood social conditions matter for the risk of adult mortality *only* in combination with adult social conditions. We explore this possibility in the analysis that follows.

## DATA, VARIABLES, AND APPROACH

### Data

Like most prior research in this area, we examined the associations between childhood conditions and adult mortality on the basis of a data set that was not designed to evaluate this problem (the original aim of the study was to collect information on labor-market experiences across multiple points in time). Nonetheless, the data have some important features that move the literature forward. The data set, the NLS, is nationally

representative of American men aged 45–59 in 1966. A comparable data set for women's mortality experiences is not available. The NLS men were interviewed through 1990, providing biographical information about the timing of mortality and changes in a rich array of socioeconomic circumstances, family relationships, and lifestyles in adulthood. The respondents were also queried about socioeconomic, familial, and residential conditions that reflected their circumstances at age 15. Although explicit measures of exposure to childhood diseases that are central to theories of life-course epidemiology (Kuh and Ben-Shlomo 1997) are unavailable, the combination of information from childhood and adulthood nonetheless allowed us to make use of Preston's (Preston et al. 1998) schema to evaluate the likely alternative *social* pathways by which childhood conditions are associated with men's mortality.

The oldest cohort in the NLS was born in the 1906–1911 period, and the youngest cohort was born in the 1917–1921 period. The respondents reached aged 15 starting in 1922 and ending in 1936. This period included the relatively prosperous post-World War I era and the economic hardships of the Great Depression. The respondents reached age 35—prime adulthood—from 1942 to 1956. This was a period that encompassed both World War II and the postwar economic boom. To take account of possible cohort effects arising from the intersection of age and historical period, we controlled for birth cohort in our analysis.

The NLS allowed us to evaluate the associations between social conditions throughout the life cycle and mortality from middle age to age 83. This is a period of life in which adult mortality is strongly influenced by social and economic conditions (House et al. 1994). At ages 45 to 83, adult mortality stems primarily from chronic diseases—diseases that arise from long-term exposure to factors such as poverty, social and familial stressors, environmental toxins, and lifestyle. Therefore, it is not surprising that these conditions are frequently thought of as the fundamental causes of disease (Link and Phelan 1995).

Of the approximately 5,000 respondents in 1966, the NLS obtained mortality information for the 1966–1990 period on 2,693 deaths via death certificates from state vital records departments or reports by widows or next of kin. The quality of the death counts is high, with no evidence of underreporting, since the Census Bureau recorded life status at the time of the interviews and deaths among men who dropped out of the survey but subsequently died prior to 1990. Although information is available on the major causes of death (e.g., heart disease, stroke, and cancer), we relied largely on information about total mortality because of the much smaller number of deaths for causes other than heart disease (approximately 49% of the total deaths in the sample were from heart disease) and the inconsistent reporting of multiple causes of death. Also, deaths from cancer were not differentiated by organ site—a factor that is important in understanding the etiology of cancer. Nonetheless, we briefly review the results for the cause-specific models to assess the extent to which cause-specific associations are reflected in the results for total mortality. Given methodological problems that are inherent in the cause-specific analysis, our interpretation is necessarily cautious.

The mortality observed in the sample coincides closely with estimates of mortality from the U.S. Vital Statistics and the Social Security Administration. On the basis of a simple Gompertz hazard model regressing the log of the risk of death on age, we estimated life-table death rates from the parameter estimates of the statistical model (for an illustration of this approach, see Teachman and Hayward 1993) and calculated a life table summarizing the mortality experiences of the sample.<sup>2</sup> The statistical model implies a life

2. Strictly speaking, the model-based approach predicts out-of-age-range death rates (death rates after age 83) on the basis of within-age-range data. We used the predicted death rates at the oldest ages to complete the life table for the NLS sample, thereby simulating the cohort's complete mortality experience. Some of the discrepancy in life expectancies reported in Table 1 likely stems from the fact that vital statistics rates are based on the mortality experiences of the entire population of men aged 45 years and older.



**Table 1.** Life Expectancy ( $e(x)$ ) for the NLS Older Men's Cohort Compared to the Social Security Life Tables for Birth Cohorts and Period

Age	$e(x)$ : NLS	$e(x)$ : 1910 Cohort	$e(x)$ : 1920 Cohort	$e(x)$ : 1980 Period
45	29.83	28.06	29.35	29.06
55	21.81	20.40	21.69	20.92
65	14.92	14.24	14.97	14.04
75	9.45	9.14	9.45	8.80
85	5.56	5.32	5.47	5.08

expectancy of 29.8 years for men aged 45 (see Table 1). This figure is slightly higher than the cohort life expectancies that were calculated by the Social Security Administration of 28.1 for the 1910 birth cohort and 29.4 for the 1920 birth cohort (Bell, Wade, and Goss 1992). Period life expectancies that were obtained from the Social Security Administration are also shown for 1980—a year roughly in the middle of the observation period. At ages 55 years and older, the cohort life expectancies closely approximate the expectancies estimated on the basis of the mortality experience of the NLS sample. The greatest discrepancy is between the NLS-based expectancies and the period-based expectancies, although the differences remain fractions of a year. This discrepancy is not surprising, since we expected that the NLS cohort's experience would track most closely with the cohort-based expectancies, given the cohort basis of both sets of expectancies and the national representativeness of the NLS cohort.

Our analysis was based on a sample of 4,562 respondents. Of the total 2,693 deaths, we excluded 13% because of missing data on adult conditions (almost exclusively missing data on the longest occupation and time-varying information on family income and wealth) and analyzed 87% of the total number of deaths (2,346 deaths). The patterns for the missing data do not indicate any systematic bias arising from exclusion because of missing data on the adult conditions.

## Variables

**Childhood social conditions.** The NLS queried respondents in 1966 (when they were aged 45–59) about their family circumstances when they were aged 15. Socioeconomic information was obtained on the occupation of the household head (professional or military, managerial, clerical, sales, crafts, operatives, household service or service, farmer, farm laborer, laborer, or missing), the household head's years of completed schooling, and whether the mother worked outside the home.<sup>3</sup> Detailed information was also collected on the family structure (i.e., whether the respondent lived with both parents; his father and stepmother; a stepfather and mother; his father only; or in some other arrangement, such as on his own. Information on childhood residence allowed us to examine whether mortality differs by the size of place of residence in childhood (i.e., rural farms, rural nonfarms, towns with fewer than 25,000 residents, suburbs of large cities, cities with 25,000–100,000 residents, and cities with more than 100,000 residents). Finally, a key family-background factor, given the historical period for this birth cohort, was the respondent's nativity and that of his parents.

An important question is whether the childhood measures reflect unhealthy conditions, generally defined. In a historical demographic study of infant mortality, Preston and Haines (1991) observed that around the turn of the century in the United States

3. Information on whether the mother worked outside the home when the respondent was aged 15 was collected in 1971.

(1900–1910), rates of infant mortality were the lowest in homes in which the fathers were farmers or salesmen and one or both parents were literate. Greater socioeconomic resources were associated with lower risks of infant mortality. Infant mortality also varied across family environments—the risks of infant mortality risks were the highest among women with no husbands in the household. Finally, there is some evidence that urban/rural residence in the early part of the twentieth century is an indicator of disease environment—rates of infant mortality were higher among urban residents than among rural residents (Preston and Haines 1991), as was overall life expectancy (Condran and Crimmins 1980).

A unique aspect of the NLS cohort is that many respondents (about 24%) were the offspring of one or more immigrant parents. Recent research has supported the idea that immigrants are strongly selected for healthiness (Rogers, Hummer, and Nam 2000), although evidence is lacking regarding the selection process in the early part of the twentieth century. Given the importance of duration of residence in the United States for health (e.g., Landale, Oropesa, and Gorman 2000), we examined the effect of both parents' and offsprings' nativity to approximate the length of time the family had lived in the United States.

We hypothesized that the risk of death would be the lowest among men who were raised in intact (two-parent) families because divorce or a parent's death is presumably a condition that incurs childhood trauma and the disruption of emotional and financial resources to a child. This hypothesis is consistent with the literature (Preston et al. 1998), although Blackwell et al. (2001) suggested that the association may be sensitive to particular disease conditions (e.g., cancer versus diabetes, cardiovascular disease, or lung conditions).

**Adult social conditions.** We considered education (years of schooling completed) as a measure of achievement in adulthood, although it is arguably a measure that reflects the end result of achievement in childhood. Our choice was based on the fact that most research that has modeled socioeconomic differences in the health of adults has included education but not other childhood conditions. Casting education as an “adult” measure allowed us to specify “traditional” models of mortality—models that mimic prior research on socioeconomic differences. It also permitted us to assess whether childhood conditions influence mortality through educational achievement, socioeconomic achievement, and lifestyle in adulthood. Finally, we assessed whether the omission of information about childhood conditions biased the effects of adult conditions.

The other components of adult socioeconomic achievement that we considered were time-varying measures of family income (in logged 1983 dollars), net asset wealth (in logged 1983 dollars),<sup>4</sup> and the longest occupation. Numerous studies have documented the association between higher levels of family income and a lower risk of death (see, e.g., Rogers et al. 2000). Increasingly, researchers are investigating the additional effects of wealth on health for persons who are past their prime earnings years, since wealth reflects both long-term economic success and a relatively permanent stock of resources. As yet, however, few studies have simultaneously examined the net effects of income and wealth on the health of adults (an exception is Smith and Kington's (1997) study, which examined the associations of these aspects of SES with functional limitations). Although little research has considered all these components of adult socioeconomic achievement, the literature generally suggests that persons with greater income and wealth face lower risks of death and morbidity (Rogers 1995; Rogers et al. 2000; Smith and Kington 1997).

---

4. Because net asset wealth had negative values for a number of cases, we added a constant to each individual's value so that the logarithm could be taken.

Occupation, another key marker of socioeconomic position, not only embodies economic prospects, but defines exposure to physical demands or stressful conditions—factors that are proximate determinants of mortality (Brunner et al. 1996; Marmot et al. 1997; Moore and Hayward 1990). We referenced occupation in terms of the longest occupation in a respondent's career to assess the effects of the greatest degree of exposure to the occupation's demands. Four conditions of work were considered: substantive complexity (the level of creativity, cognitive-skill demands, and autonomy that persons have in their jobs), physical and environmental demands, social-skill demands, and manipulative-skill demands.<sup>5</sup> Higher risks of mortality are typically associated with physical demands and low levels of creativity, cognitive-skill demands, and autonomy, although the net effects of these conditions are rarely evaluated with regard to a more comprehensive set of socioeconomic factors.

Other adult social conditions that we considered were marital status and urban/rural residence. Although the effect of differences in marital status on mortality have been debated, the general pattern is that married men have better health than do divorced or widowed men (Lillard and Waite 1995; Pienta, Hayward, and Jenkins 2000; Rogers 1995; Rogers et al. 2000). Urban men also appear to have higher mortality rates than do rural men—a paradoxical pattern, given that rural residents have historically had inferior health care services, lower incomes, less health insurance coverage, and greater traveling distances to obtain care (Hayward et al. 1997).

We used retrospective information to construct two lifestyle measures—the average level of alcohol consumption over the lifetime and a time-varying measure of smoking status. In 1990, interviewers asked the respondents or surviving widows or proxies a series of questions about smoking and alcohol consumption. A U-shaped association has frequently been observed between alcohol consumption and mortality in population-based studies—teetotalers and persons with high rates of daily consumption of alcohol have higher death rates than do persons with moderate rates of daily alcohol consumption. Smoking is associated with elevated rates of mortality (Rogers et al. 2000). We coded smoking using dummy variables that identified whether the respondent “never smoked,” was a “former smoker,” or was “currently smoking” (the reference group). Alcohol consumption was indicated by whether the respondent averaged “zero drinks,” “1–2 drinks,” “3–4 drinks,” or “5 or more drinks” per day.

In 1973, the respondents were asked about their height and weight, which allowed us to construct a body mass index (BMI) for persons who had survived to this point; persons who did not survive or who dropped out of the study before 1973 (about 13%) were assigned to a missing category that was included in the modeling of mortality. Like alcohol consumption, the association between body mass and adult mortality is generally U shaped; that is, the risks of death appear to be the highest among persons with very low and very high levels of body mass. We coded the BMI into five categories that roughly correspond to standard anthropomorphic definitions: underweight (BMI < 20), two normal weight categories (BMI 20–23 and 23.1–25), overweight (BMI 25.1–27.5), and obese (BMI 27.6–52.1).

## Approach

We estimated a series of nested discrete-time hazard models to evaluate the ways in which social conditions in childhood and adulthood are associated with mortality. The discrete-time approach we used assumes an underlying continuous time process and is

---

5. Information from Miller et al. (1980) was matched to the respondents' reports of their longest occupation. Moore and Hayward (1990) provided a detailed description of the construction of the four measures of occupational work activities.



based on the force of mortality, expressed in the form of an annual rate. Mathematically, we have

$$h(x) = \lim_{n \downarrow 0} \frac{P(x+n > T \geq x | T \geq x)}{n},$$

where  $h(x)$  represents the force of mortality at exact age  $x$ , given that a person has survived to that age. We assumed that  $h(x+t)$  is constant over the  $(x, n)$  age interval, resulting in an exponential force of mortality within a one-year age interval.

We captured the association between the mortality risk and age (i.e., exact age  $x$  at the beginning of each age interval) by specifying the log-linear model:

$$\ln h(x) = \beta_0 + \beta_1 X,$$

where  $X$  is the age of a person at his previous birthday. We chose the Gompertz specification of duration (i.e., age) dependence because it provided the best fit of the model to the data. It also is the most common way of delineating age dependence in mortality in the general population. As noted earlier, our statistical model of the cohort's mortality coincides closely with cohort-based life expectancies obtained from the Social Security Administration (Bell et al. 1992).

We specified four models to examine how the effects of childhood conditions on the risk of mortality are altered when we considered adult life-cycle characteristics. Briefly, these models are

$$\ln h(x) = \beta_0 + \beta_1 X + \gamma_i CHILD_i$$

$$\ln h(x) = \beta_0 + \beta_1 X + \gamma_i CHILD_i + \beta_2 EDUC$$

$$\ln h(x) = \beta_0 + \beta_1 X + \gamma_i CHILD_i + \beta_2 EDUC + \beta_3 MS + \beta_4 URBAN + \gamma_j ADULTSES_j$$

$$\ln h(x) = \beta_0 + \beta_1 X + \gamma_i CHILD_i + \beta_2 EDUC + \beta_3 MS + \beta_4 URBAN + \gamma_j ADULTSES_j + \gamma_k LIFESTYLE_k.$$

The first model was estimated to approximate the total effects of a vector of  $i$  childhood conditions (CHILD), net of age, race, and five-year birth cohort. We then incorporated education (EDUC) and examined changes in the effects of the childhood conditions to assess whether the conditions operate indirectly via educational achievement. Our evaluation was based on the magnitude of change in the parameter estimates, rather than on a formal evaluation of whether changes in the parameter estimates are statistically significant. Clogg, Petkova, and Haritou (1995) proposed a method for statistically evaluating changes in parameter estimates in a nested-model approach for quantitative outcomes; this approach has not been extended to the class of log-linear models shown here.

Marital status (MS) and adult residence (URBAN), both time-varying adult conditions, were added next in Model 3. One plausible hypothesis is that childhood disadvantages are associated with mortality by decreasing the chances of strong social attachments, such as marriage in adulthood. In Model 3, we also added the vector of adult socioeconomic conditions (ADULTSES), while the fourth model incorporates the vector of lifestyle measures (LIFESTYLE). Again, our aim was to assess whether the associations between childhood conditions and adult mortality are reduced when these adult circumstances are controlled. Reductions in the effects of childhood conditions are indicative of indirect effects on mortality via adult achievement processes and lifestyles. Finally, we estimated a fifth model (not shown) that eliminated the vector of childhood conditions. This model conforms to the traditional specification of mortality in terms of

**Table 2. Childhood Circumstances of NLS Men (Weighted Percentages; *N* of individuals = 4,562)**

Variable	Percentage	Variable	Percentage
Household Head's Education When the Respondent Was 15		Living Arrangements When the Respondent Was 15	
6 years or less	25.0	Father and mother	76.2
7–8 years	20.6	Father and stepmother	1.7
9–12	11.1	Mother and stepfather	2.1
13 or more years	6.6	Father only	3.1
Missing	36.7	Mother only	8.7
Household Head's Occupation When the Respondent Was 15		Other	8.1
Professional or military	4.9	Mother's Work Status When the Respondent Was 15	
Managerial	12.2	Did not work	61.1
Clerical	2.0	Worked	11.3
Sales	3.2	Missing	27.6
Crafts	13.7	Childhood Urban/Rural Residence	
Operative	12.8	City with 100,000 or more people	20.2
Private household or service worker	5.2	City with 25,000–100,000 people	10.9
Farmer	32.0	Suburb of a large city	2.4
Farm laborer	1.4	Town with fewer than 25,000 people	27.7
Laborer	6.3	Rural nonfarm area	3.6
Missing	7.3	Rural farm area	35.2
Foreign Born	6.4		
Parents' Nativity			
One parent was foreign born	7.0		
Two parents were foreign born	21.6		
Neither parent was foreign born	71.4		

adult conditions and lifestyles. We used this model, in combination with the full model (Model 4), to evaluate whether the effects of adult conditions are biased when childhood conditions are omitted from the model.

## RESULTS

### The Conditions of Childhood and Adulthood

As is shown in Table 2, the NLS men's childhood conditions primarily reflected the characteristics of the American adult population during the 1920s and 1930s.<sup>6</sup> NLS men lived

6. One difficulty in examining the effects of childhood conditions on adult mortality, particularly with the type of study design considered here, is the retrospective recollection of childhood conditions. In Table 2, note, for example, that the respondents had some difficulty answering the questions about the education of the household head, the household head's occupation, and the mother's work status. We chose not to impute this information, but we explicitly defined missing categories for the childhood measures, which allowed us to retain the maximum number of cases in the analysis. We also assessed the similarity of "missingness" to valid responses in terms of the association with the risk of mortality. We estimated a series of multinomial logistic regression models to evaluate the characteristics of the respondents with missing values on parental education and mother's work status. The results showed that the respondents with missing values on parental education were more likely to be black, to grow up in blue-collar households, to live in rural areas, and to have foreign-born parents. A similar pattern of associations was observed for persons with missing values on the "mother worked" measure.

in households where the heads had low levels of education by today's standards (25% of the heads had six or fewer years of education) and worked in blue-collar occupations or farming. Most men lived with both their biological mothers and fathers (about 76%), and roughly 4% lived in households with a stepparent. Over 20% of the men lived in homes in which one or both parents were absent.

On the whole, mothers did not work outside the home. We estimated a multinomial logistic regression model with mother worked as a polytomous dependent variable (mother worked, mother did not work, missing) to obtain a better interpretation of mother's work status vis-à-vis other childhood conditions (results not shown). The patterns of association indicate that mother's work status primarily reflects substantial economic disadvantage. Mothers were significantly more likely to work when the household heads worked in blue-collar positions; had a sixth-grade education or less; or were black, foreign born, or a stepparent.

Given the occupational distribution of the household head, it is not surprising that the NLS respondents grew up primarily in rural communities. About 28% lived in towns with populations of fewer than 25,000 persons. Almost 40% lived on rural farms.

Although only about 6% of the NLS men were born outside the United States, approximately 22% were the offspring of two immigrant parents, and another 7% had one parent who was foreign born. This finding reflects the large migration waves that occurred prior to World War I. Although the data do not provide information on how long a parent or respondent lived in the United States, we were able to examine the overall association between nativity and adult mortality.

Table 3 presents information on the social and economic conditions of the NLS men as adults. Although these men were better educated than their parents, the amount of schooling they completed was still low by current standards (approximately 37% had eight or fewer years of schooling). While the majority of men reported living on farms or in small towns when they were young (see Table 2), a more diverse pattern of residence appeared in adulthood, with over two thirds of the sample living in urban or suburban areas. The average net wealth observed over the observation period (in 1983 dollars) was \$79,199,<sup>7</sup> and the average family annual income (in 1983 dollars) was \$27,077. Lifestyle measures paint a mixed picture of the health of these men. Although average levels of alcohol consumption were fairly low, 45% of the sample were overweight and 45% were current cigarette smokers.

### **The Influence of Childhood Conditions on Adult Mortality**

The results shown in Table 4 (Model 1) provide evidence of statistical associations between a range of childhood conditions and mortality. We found statistical associations between the risk of mortality and childhood conditions for occupation, family structure, mother working, urban/rural residence, and parents' nativity, net of age and race. We did not find any statistical evidence of associations between mortality and the household head's education (net of occupation) or the respondent's nativity.

The respondents from blue-collar homes (i.e., the household heads were operatives or laborers) had substantially elevated risks of death compared to those from upper-status white-collar homes and homes in which the household heads were employed in the service industry. In the early part of the 20th century, workers in these occupations faced onerous physical demands and environmental stressors, heavily routine work, and low pay. Occupational mortality rates were the highest in these positions than in all other occupations in 1930 (Whitney 1934).

---

7. A constant of \$100,000 was added to both financial measures to eliminate negative values. The rescaled values were then logged to reduce the skew in these measures.

**Table 3. Characteristics of NLS Men as Adults (Weighted Means and Percentages; *N* of Individuals = 4,562)**

Variable	Mean or Percentage	Variable	Mean or Percentage
Demographic Characteristics		Characteristics of the Longest Occupation	
Age (mean)	52.1	Manipulative skill (mean)	-0.08
Black	8.9	Physical demands (mean)	0.36
Birth cohort		Social skill (mean)	-0.22
1905-1910	25.9	Substantive complexity (mean)	-0.12
1911-1915	33.6	Body Mass Index	
1916-1921	40.5	Under 20	3.1
Education		20-23	14.7
8 years or less	37.4	23.1-25	18.0
9-12 years	44.3	25.1-27.5	26.0
13 or more years	18.3	27.6-52.1	18.5
Marital Status		Missing	19.7
Married	90.3	Mean Weekly Alcohol Consumption	
Never married	4.0	None	50.7
Divorced	3.9	1-2 drinks	22.1
Widowed	1.8	3-4 drinks	5.0
Urban/Rural Residence		5 or more drinks	6.1
Urban	31.8	Missing	16.1
Suburban	38.2	Smoking Behavior	
Rural	30.0	Currently smoking	45.2
Ln of Net Assets (mean)	12.0	Never smoked	23.7
Ln Total Family Income (mean)	11.8	Quit	16.7
		Missing	14.4

At first glance, the effects of family structure appear puzzling because men who lived with both biological parents (the reference category) did not have the expected lowest risk of death. However, to interpret the effects of family structure, we must account for the effect of mother's work status; men who did not reside with their mothers did not report her work status, and "missing" is associated with a 99% higher risk of death. Once we adjusted the family-structure effects, assuming an additive model, we found that the pattern of results is consistent with a family-investment model—men who resided with their biological fathers and mothers who did not work for pay had the lowest risk of death. The mortality risk was 1.24 times higher among men who lived with both biological parents but whose mothers worked for pay. Men who resided with their stepfathers and biological mothers who worked outside the home faced a mortality risk that was 1.46 times that of the reference category. Men who lived in some other arrangement (e.g., on their own) at age 15 had similarly high rates of death. These effects are consistent with prior studies that reported that two-biological-parent households are best able to invest in offspring's well-being (Amato and Booth 1997; McLanahan and Sandefur 1994).

The results indicate that men who grew up on rural farms had significantly lower rates of death than did men who grew up in large cities (who faced a mortality risk that was 1.21 times larger), even when the household head's occupation was controlled, a finding that is consistent with other research that was based on historical data for the

**Table 4. Effects of Childhood and Adult Life-Cycle Characteristics on Men's Mortality: National Longitudinal Survey of Older Men, 1966–1990 (N of Deaths = 2,346)**

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	-8.945***	-8.855***	0.329	0.147
Demographic Characteristics				
Age	0.083***	0.084***	0.082***	0.089***
Black	0.200***	0.161**	0.008	0.044
Birth cohort (ref. = 1916–1921)				
1906–1910	-0.024	-0.022	-0.019	0.034
1911–1915	-0.009	0.015	0.029	0.084
Early Life Cycle Characteristics				
Household head's education (ref.: ≤ 6 years)				
7–8 years	-0.075	-0.033	-0.039	-0.068
9–12 years	0.008	0.079	0.094	0.079
13 or more years	-0.053	0.054	0.090	0.111
Missing	0.006	0.009	-0.006	-0.044
Household head's occupation (ref.: laborer)				
Professional or military	-0.437**	-0.326*	-0.290 <sup>†</sup>	-0.184
Managerial	-0.347***	-0.265*	-0.210*	-0.172
Clerical	-0.139	-0.097	-0.057	0.076
Sales	-0.200	-0.127	-0.099	0.013
Crafts	-0.161 <sup>†</sup>	-0.127	-0.101	-0.023
Operative	-0.042	-0.020	-0.011	0.030
Private household or service work	-0.320**	-0.283*	-0.245*	-0.215 <sup>†</sup>
Farmer	-0.186 <sup>†</sup>	-0.175 <sup>†</sup>	-0.132	-0.120
Farm laborer	-0.083	-0.089	-0.080	-0.100
Missing	-0.212 <sup>†</sup>	-0.174	-0.161	-0.149
Family structure (ref.: father and mother)				
Father and stepmother	-0.588***	-0.615***	-0.617***	-0.351*
Mother and stepfather	0.165	0.149	0.152	0.199
Father only	-0.418***	-0.422***	-0.443***	-0.161
Mother only	-0.022	-0.052	-0.071	-0.062
Other	-0.319***	-0.346***	-0.351***	-0.068
Mother worked				
0.216***	0.213***	0.186**	0.126 <sup>†</sup>	
Missing	0.689***	0.675***	0.678***	0.159**
Childhood residence (ref.: city 100,000+)				
City with 25,000–100,000 people	-0.055	-0.054	-0.048	0.005
Suburb of a large city	0.123	0.105	0.124	0.199
Town with fewer than 25,000 people	0.009	-0.026	-0.003	0.001
Rural nonfarm area	0.023	-0.020	0.025	0.107
Rural farm area	-0.187*	-0.244**	-0.193*	-0.134
Foreign born				
-0.103	-0.115	-0.114	-0.166	
Parents' nativity (ref.: both native born)				
One parent was foreign born	-0.199*	-0.199*	-0.193 <sup>†</sup>	-0.153
Two parents were foreign born	-0.217**	-0.214**	-0.191**	-0.187**

(continued)



(Table 4, continued)

Variable	Model 1	Model 2	Model 3	Model 4
Adult Life Cycle Characteristics				
Education (ref.: 8 years or less)				
9–12 years		–0.174***	–0.136**	–0.113*
13 or more years		–0.363***	–0.168†	–0.160†
Marital status (ref.: widowed)				
Married			–0.313***	–0.317***
Never married			–0.396**	–0.482***
Divorced			0.072	0.053
Urban/rural residence (ref.: rural)				
Urban			0.086	0.027
Suburban			0.044	0.009
Ln of net assets			–0.152**	–0.103†
Ln total family income			–0.607***	–0.667***
Characteristics of the longest occupation				
Manipulative skill			0.015	–0.012
Physical demands			0.008	–0.006
Social skill			0.050	0.016
Substantive complexity			–0.085*	–0.063†
Body Mass Index (ref.: under 20)				
20–23				–0.163
23.1–25				–0.313*
25.1–27.5				–0.210†
27.6–52.1				–0.115
Missing				0.770***
Mean weekly alcohol consumption (ref.: none)				
1–2 drinks				–0.249***
3–4 drinks				–0.038
5 or more drinks				0.121
Missing				0.597***
Smoking behavior (ref.: currently smoking)				
Never smoked				–0.225***
Quit				–0.348***
Missing				–0.277*
Log-Likelihood	–10,308.9	–10,296.4	–10,250.4	–10,020.9

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ 

United States (Preston et al. 1998). Nativity of the respondent is not significantly associated with mortality in Model 1, although the zero-order effect is. Regardless of model specification, however, our results show that men whose mothers and fathers were both immigrants had the lowest risk of mortality, and there is some indication that even having one immigrant parent had a protective effect. The mortality risk was 1.24 times higher among men with native-born parents.

When education was incorporated into the model (see Model 2), its effect showed a strong negative gradient—persons with higher educational attainment have a lower risk

of mortality, net of childhood conditions. The incorporation of education resulted in about a 25% decline in the magnitude of the occupational effects, suggesting that a portion of the association between the household head's occupation and mortality in Model 1 operates through the offspring's educational attainment. The other effects of childhood conditions remained relatively unchanged when education was incorporated, suggesting that this mechanism is largely specific to parents' occupational status.

Model 3 added marital status, adult residence, and measures of SES to Model 2. The addition of marital status and adult residence also produced little change in the effects of the childhood conditions, although marital status itself has a significant net effect. Married men and never-married men had the lowest risks of mortality relative to men who were widowed. However, measures of socioeconomic achievement in adulthood substantially reduced the effects of the childhood household head's occupation, although they remained significant. The effect of the respondent's own education was also reduced in magnitude when the financial measures and the characteristics of the longest occupation were incorporated into the model, although the effect of education remained statistically significant. The effects of childhood family structure, mother's work status, urban/rural residence, and parental nativity all remained robust and statistically significant in Model 3. The effects of the adult SES measures, net of the childhood measures, also had statistical associations with the risk of mortality in the expected direction. Men with high levels of family income and household wealth and who worked in substantively complex occupations faced the lowest risks of death.

When the lifestyle conditions were introduced in Model 4, the pattern of associations between the childhood measures and mortality was substantially altered. Childhood residence no longer had a statistical association with mortality. We also observed substantial reductions in the effects of occupation of the household head, family structure, and mother's work status. Only the effect of parental nativity persisted when we included the lifestyle measures in Model 4. Controlling for lifestyle factors also reduced the effects of asset wealth and substantive complexity, indicating that adults' lifestyle characteristics are one of the mechanisms through which adult SES affects mortality in later life.

With regard to the associations between the lifestyle measures and mortality, our results show the familiar U-shaped associations among alcohol consumption, body mass, and death. Moderate alcohol consumption is associated with the lowest risk of death. Men in the second quartile of the BMI distribution had the lowest risk of death, and men with very low body mass (in the lowest 5% of the distribution) had the highest. It is not surprising that current smokers had the highest risk of death compared with those who had never smoked and those who had quit smoking.

We estimated a series of models stepping the lifestyle measures in and out of Model 4 to derive a better sense of which lifestyle factors were responsible for the reduction in the effects of childhood and adult social conditions (results not shown). The modeling exercise indicated that body mass is the factor that is largely responsible for the changes in the associations between Models 3 and 4. Models that included smoking behavior and alcohol consumption but excluded body mass resulted in a pattern of associations for the childhood and adult conditions that was similar to those reported in Model 3. Multinomial logistic regression models confirmed that persons with the childhood familial and adult socioeconomic characteristics associated with the low risk of death were also more likely to have a BMI score that is associated with a low risk of death. This pattern was reinforced somewhat by moderate levels of drinking among men who were raised in white-collar homes and higher levels of nonsmoking among men who were reared in rural farm areas.

We deleted the childhood conditions from Model 4 to approximate traditional models examining socioeconomic disparities in adult mortality (results not shown). Overall, the effects of the adult SES measures and lifestyle conditions were consistent with prior research. Moreover, the effects of the adult life-cycle characteristics remained relatively

unchanged when childhood conditions were excluded. One exception was the lack of a statistical association between education and mortality when childhood conditions were omitted. This finding suggests that traditional models of socioeconomic disparities in mortality may underestimate the association between education and the risk of death. With this possible exception, however, our results suggest that the results of prior studies that have not incorporated childhood conditions are not significantly biased.

Given the importance of parental nativity and maternal work status in our models, we tested interactions between these measures and adult SES and lifestyle measures. We also examined whether social mobility, defined by interactions between childhood and adult measures, influenced mortality. None of the interactions was statistically significant. Similar to prior studies on the effects of life-cycle characteristics on mortality, our results support the idea that social conditions in childhood and adulthood influence adult mortality in an additive manner (e.g., Blackwell et al. 2001; Costa 1999; Moore and Hayward 1990).

Finally, in results not shown, we estimated preliminary models that examined whether the association between early life conditions, adult SES and lifestyles, and mortality from heart disease is primarily driving the results reported in Table 4. Using the same model-building structure presented in Table 4, we examined five separate cause-of-death models in which *cause* refers to the primary cause of death. The causes were heart disease, cancer (not site specific), stroke, chronic obstructive pulmonary disease (COPD), and a residual "other" category. We found that mortality from heart disease is largely driving the results we report in Table 4. However, significant effects in the full model were also found between early life conditions and each of the other primary causes of death. For example, we observed that COPD death rates were the lowest among men who lived on rural farms in childhood, net of all other childhood and adult characteristics. Death rates from cancer were strongly associated with mother's work status and family living arrangements, with cancer rates the highest among men whose mothers worked and who lived in homes without mothers. We view these results as illustrative, rather than definitive, given potential measurement error in the primary cause of death and the lack of site specificity with regard to cancer. Nonetheless, they point to the need for future research to assess the degree of specificity in the associations between childhood factors and adult mortality.

## CONCLUSIONS

We began our discussion by posing the question of whether childhood conditions are associated with men's mortality, and if so, what mechanisms may be responsible for these associations. Our results suggest that a variety of childhood conditions have long-term consequences. Childhood socioeconomic conditions, the type of community the family lived in, family living arrangements and mother's work status, and nativity all exhibit independent effects on men's mortality, illustrating the broad scope of social forces that come into play in altering life chances. Men who grew up in blue-collar homes, who lived in urban areas, who lived with their biological fathers and stepmothers, whose mothers worked outside the home, and whose parents were both native born all faced elevated risks of mortality.

In general, we observed that the associations between childhood socioeconomic and family conditions and men's mortality were largely indirect through socioeconomic-achievement processes and lifestyles in adulthood. We found little to no evidence in support of the other potential pathways, described by Preston et al. (1998), linking childhood circumstances to adult mortality (i.e., a physiological "scarring" effect, an acquired immunity effect, or an indirect and negative selection process). Because of the absence of information, we were unable to model directly the effects of early exposure to disease. However, we observed few residual childhood effects to which we could attribute such an exposure effect—the possible exception being the association between childhood

residence and COPD-related deaths. Socioeconomic-achievement processes in adulthood that are reflected in education, family income, household wealth, and occupational career primarily mediated the influence of childhood SES as reflected in the occupation of the household head. The occupational effect appears to influence the risk of mortality by influencing adult achievements in that socioeconomic disadvantages in childhood are associated with disadvantages in adulthood that place men at a greater risk of death. Adult lifestyle factors, particularly body mass, mediated the effects of childhood family living arrangements, mothers working outside the home, and urban/rural residence. The mortality advantage of childhood residence on a farm, for example, appears to be primarily a product of a healthier lifestyle as an adult. We explored this relationship further by regressing BMI, smoking, and drinking behavior on early life conditions (results not shown). Childhood residence (particularly residence on a farm) is a strong predictor of moderate BMI levels and moderate alcohol consumption, while parental education and nativity are significant predictors of smoking behavior in adulthood (men with highly educated parents and who are the offspring of immigrants are less likely to smoke). Childhood origins thus appear to have an indirect association with mortality through both health behaviors and achievement processes in adulthood.

Only the effect of parental nativity was relatively persistent when measures of adult socioeconomic-achievement processes and lifestyle factors were incorporated into the model. More research is needed to understand what it is about immigrant parents that benefits the *long-term* health of their offspring, although previous research that documented the positive health outcomes among young children of immigrant parents offered some clues to the potential mechanisms (e.g., resourcefulness and goal orientation, embeddedness in strong family-support networks that reduce stress and promote more healthy behaviors) (Landale, Oropesa, and Gorman 2000; Landale et al. 1999; Rumbaut and Weeks 1996). The role of body mass in linking childhood social conditions to adult mortality, a new finding as far as we are aware, points as well to more in-depth research on how childhood origins affect adult mortality via adult lifestyle (Lynch et al. 1997).

Although the specific nature of the mechanisms remains ambiguous, our research makes clear that childhood socioeconomic and family disadvantages set in motion a series of cascading socioeconomic and lifestyle events that have negative consequences for men's mortality. Clearly, there is no one "superhighway" by which childhood circumstances influence adult mortality. Instead, childhood circumstances are linked to a web of pathways through which men's life chances are altered. Despite the complexity of these processes, it is clear that individuals who were born into advantaged circumstances "retain some of those advantages throughout life" (Preston et al. 1998:1232). Correlated environments over the life course define, to a large extent, the ways in which social conditions influence men's mortality.

Our results also suggest that the findings of previous studies on socioeconomic differences in mortality that did not include information about childhood circumstances are relatively robust and unbiased. Our finding that the overall pattern of associations is stable when childhood conditions are not controlled is important, since the inclusion of childhood conditions in most surveys of population health has been the exception, rather than the rule.

At least in the case of the United States, our analysis shows that education, family income, household wealth, and occupational working conditions are *all* significant facets of adults' socioeconomic position along which men's mortality is stratified. These are not isomorphic concepts and represent the multiplicity of ways in which socially defined resources confer health advantages. The multiplicity of effects makes it difficult to choose one measure as the primary axis to gauge socioeconomic inequality in mortality or to identify which factor contributes more than the others in accounting for socioeconomic disparities. These tasks are even more difficult once it is recognized that education,

occupation, income, and wealth themselves vary over the adult life course, as does the salience of these measures for defining a person's socioeconomic position.

Although the findings presented here contribute to an understanding of mortality in adulthood, our study has limitations that caution against overinterpretation. First, no information on childhood health conditions was available in the NLS. Hence, it is possible that the relationship described between early life social conditions and adult mortality is biased, in that the observed relationships may be mediated, to some extent, by an association between unmeasured indicators of childhood health and adult mortality. Second, information on childhood social conditions (when the respondent was aged 15) was gathered retrospectively when the respondents were aged 45 to 59. This analysis thus presumes that childhood conditions were correctly reported; that the relative ordering of childhood conditions was relatively persistent throughout childhood; and that dramatic social mobility during childhood was the exception, rather than the rule. Even so, it is likely that some recall bias is present in our measures of childhood social conditions. Third, information on adult lifestyle was not gathered in 1966, the first year of the study; information used to construct the BMI was collected in 1973, and information on smoking and drinking was gathered in 1990. If the respondents had died by 1973, they were assigned a missing value for the BMI. If the respondents had died before 1990, information on the respondents' drinking and smoking behavior was gathered from surviving widows or proxies. Because almost no proxy information on smoking and drinking behavior was gathered for respondents who had not died, missing categories for the BMI, smoking, and drinking represent, to some extent, men who had already died. As a result, it is possible that the influence of early life social conditions was attenuated by the inclusion of missing dummy measures for the BMI, smoking, and drinking, since they may be related to men's earlier deaths. Furthermore, because information on smoking and drinking was gathered late in the study (1990), and reports by wives and other proxies of smoking and drinking behavior were used, it is likely that these measures encompass measurement error.

Even with these limitations, our findings emphasize that the factors that influence men's mortality risk are not strictly based on choices made in adulthood, but are also rooted in childhood social conditions. From a policy perspective, this point brings into sharp focus the idea that economic and educational policies are implicitly health policies. Policies that focus on children's health, economic security, and education are likely to have far-reaching effects, some of which are manifested decades later in the reduction of major chronic diseases, such as cardiovascular diseases or diabetes. Scientific evidence on this association has been growing rapidly over the past decade (Elo and Preston 1992; Kuh and Davey Smith 1997; Kuh et al. 1997; Kuh and Wadsworth 1993), and this evidence has fostered the development of policy-related health programs, such as World Health Organization's Ageing and Life Course Program in the Department of Noncommunicable Disease Prevention and Health Promotion. Although American public policies remain largely age-targeted, there is growing recognition that health-care policies that benefit the elderly are inextricably tied to policies that benefit children. Not only is individual well-being enhanced, but societies benefit by lowering the collective costs of health care and the burden of disease in a population. This issue will be more and more important as the American population continues its transition to a mature and stable population over the next 50 years.

## REFERENCES

- Alter, G., M. Oris, and B. Göran. 2001. "The Family and Mortality: A Case Study From Rural Belgium." *Annales de Démographie Historique* No. 1:11–31.
- Amato, P.R. and A. Booth. 1997. *A Generation at Risk: Growing Up in an Era of Family Upheaval*. Cambridge, MA: Harvard University Press.
- Barker, D.J.P. 1998. *Mothers, Babies, and Health in Later Life*. London: Churchill Livingstone.



- Bell, F.C., A.H. Wade, and S.C. Goss. 1992. "Life Tables for the United States Social Security Area 1900–2080." Baltimore, MD: Office of the Actuary, Social Security Administration.
- Blackwell, D., M.D. Hayward, and E.M. Crimmins. 2001. "Does Childhood Health Affect Chronic Morbidity in Later Life?" *Social Science and Medicine* 52:1269–84.
- Brunner, E., G. Davey Smith, M. Marmot, R. Canner, M. Beksinska, and J. O'Brien. 1996. "Childhood Social Circumstances and Psychosocial and Behavioural Factors as Determinants of Plasma Fibrinogen." *Lancet* 347(9007):1008–13.
- Buck, C. and H. Simpson. 1982. "Infant Diarrhoea and Subsequent Mortality From Heart Disease and Cancer." *Journal of Epidemiology and Community Health* 36:27–30.
- Clogg, C.C., E. Petkova, and A. Haritou. 1995. "Statistical Models for Comparing Regression Coefficients Between Models." *American Journal of Sociology* 100:1261–93.
- Condran, G.A. and E.M. Crimmins. 1980. "Mortality Differentials Between Rural and Urban Areas of States in the Northeastern United States, 1890–1900." *Journal of Historical Geography* 6:179–202.
- Costa, D.L. 1999. "Understanding the Twentieth Century Decline in Chronic Conditions Among Older Men." *Demography* 37:53–71.
- Dahl, E. and G.E. Birkelund. 1997. "Health Inequalities in Later Life in a Social Democratic Welfare State." *Social Science and Medicine* 44:871–81.
- Elo, I.T. and S.H. Preston. 1992. "Effects of Early-Life Conditions on Adult Mortality: A Review." *Population Index* 58:186–212.
- Gunnell, D.J., S. Frankel, K. Nanchahal, F.E.M. Braddon, and G. Davey Smith. 1996. "Lifecourse Exposure and Later Disease: A Follow-up Study Based on a Survey of Family Diet and Health in Pre-war Britain (1937–1939)." *Public Health* 110:85–94.
- Hayward, M.D., E.M. Crimmins, T.P. Miles, and Y. Yu. 2000. "The Significance of Socioeconomic Status in Explaining the Racial Gap in Chronic Health Conditions." *American Sociological Review* 65:910–30.
- Hayward, M.D., A. Pienta, and D.K. McLaughlin. 1997. "Inequality in Men's Mortality: The Socioeconomic Status Gradient and Geographic Context." *Journal of Health and Social Behavior* 38:213–34.
- House, J.S., J.M. Lepkowski, A.M. Kinney, R.P. Mero, R.C. Kessler, and R.A. Herzog. 1994. "The Social Stratification of Aging and Health." *Journal of Health and Social Behavior* 35:213–34.
- Karasek, R.A. 1990. "Lower Health Risk With Increased Job Control Among White-Collar Workers." *Journal of Organizational Behavior* 11:171–85.
- Karasek, R.A., T. Thorell, and J.E. Schwartz. 1988. "Job Characteristics in Relation to the Prevalence of Myocardial Infarction in the US Health Examination Survey (HES) and the Health and Nutrition Examination Survey (HANES)." *American Journal of Public Health* 78:910–18.
- Kuh, D. and B. Ben-Shlomo. 1997. *A Life Course Approach to Chronic Disease Epidemiology*. New York: Oxford University Press.
- Kuh, D. and G. Davey Smith. 1997. "The Life Course and Adult Chronic Disease: An Historical Perspective With Particular Reference to Coronary Heart Disease." Pp. 15–41 in *A Life Course Approach to Chronic Disease Epidemiology*, edited by D. Kuh and B. Ben-Shlomo. New York: Oxford University Press.
- Kuh, D., C. Power, D. Blane, and M. Bartley. 1997. "Social Pathways Between Childhood and Adult Health." Pp. 169–98 in *A Life Course Approach to Chronic Disease Epidemiology*, edited by D. Kuh and Y. Ben-Shlomo. New York: Oxford University Press.
- Kuh, D. and M.E.J. Wadsworth. 1993. "Physical Health Status at 36 Years in a British National Birth Cohort." *Social Science and Medicine* 37:905–16.
- Landale, N.S., R.S. Oropesa, and B.K. Gorman. 2000. "Migration and Infant Death: Assimilation or Selective Migration Among Puerto Ricans?" *American Sociological Review* 65:888–909.
- Landale, N.S., R.S. Oropesa, D. Llanes, and B.K. Gorman. 1999. "Does Americanization Have Adverse Effects on Health? Stress, Health Habits, and Infant Health Outcomes Among Puerto Ricans." *Social Forces* 78:613–41.

- Lillard, L.A. and L.J. Waite. 1995. "Til Death Do Us Part: Marital Disruption and Mortality." *American Journal of Sociology* 100:1131-56.
- Link, B.G. and J. Phelan. 1995. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior* 36(Extra Issue):80-94.
- Lundberg, O. 1993. "The Impact of Childhood Living Conditions on Illness and Mortality in Adulthood." *Social Science and Medicine* 36:1047-52.
- . 1997. "Childhood Conditions, Sense of Coherence, Social Class, and Adult Ill Health: Exploring Their Theoretical and Empirical Relations." *Social Science and Medicine* 44:821-31.
- Lynch, J.W., G.A. Kaplan, and J.T. Salonen. 1997. "Why Do Poor People Behave Poorly? Variation in Adult Health Behaviours and Psychosocial Characteristics by Stages of the Socioeconomic Lifecourse." *Social Science and Medicine* 44:809-19.
- Marmot, M.G., H. Bosma, H. Hemingway, E. Brunner, and S. Stansfeld. 1997. "Contribution of Job Control and Other Risk Factors to Social Variations in Coronary Heart Disease Incidence." *Lancet* 350:235-39.
- Marmot, M.G. and M.J. Shipley. 1996. "Do Socioeconomic Differences in Mortality Persist After Retirement? 25 Year Follow Up of Civil Servants From the First Whitehall Study." *British Medical Journal* 313:1177-80.
- Mathews, J.D., S. Whittingham, and I.R. Mackay. 1974. "Autoimmune Mechanisms in Human Vascular Disease." *Lancet* 2:1423-27.
- McLanahan, S. and G. Sandefur. 1994. *Growing Up With a Single Parent: What Hurts, What Helps*. Cambridge, MA: Harvard University Press.
- Miller, A.R., D.J. Treiman, P.S. Cain, and P.A. Roos. 1980. *Work, Jobs, and Occupations: A Critical Review of the Dictionary of Occupational Titles*, 4th ed. Washington, DC: National Academy Press.
- Moore, D.E. and M.D. Hayward. 1990. "Occupational Careers and Mortality of Older Men." *Demography* 27:31-53.
- O'Rand, A.M. 2001. "Stratification and the Life Course." Pp. 197-213 in *Handbook of Aging and the Social Sciences*, 5th ed., edited by R.K. Binstock and L.K. George. San Diego, CA: Academic Press.
- Parcel, T.L. and E. Menaghan. 1994. *Parents' Jobs and Children's Lives*. New York: Aldine de Gruyter.
- Paunio, M., O.P. Heinonen, M. Virtanen, P. Leinikki, A. Patja, and H. Peltola. 2000. "Measles History and Atopic Diseases: A Population-Based Cross-Sectional Study." *Journal of the American Medical Association* 283:343-46.
- Pienta, A., M.D. Hayward, and K.R. Jenkins. 2000. "Patterns of Health and Marriage in Later Life." *Journal of Family Issues* 21:559-86.
- Power, C. and C. Peckham. 1990. "Childhood Morbidity and Adulthood Ill Health." *Journal of Epidemiology and Community Health* 44:69-74.
- Preston, S.H. and M.R. Haines. 1991. *Fatal Years: Child Mortality in Late Nineteenth Century America*. Princeton, NJ: Princeton University Press.
- Preston, S.H., M.E. Hill, and G.L. Drevenstedt. 1998. "Childhood Conditions That Predict Survival to Advanced Ages Among African-Americans." *Social Science and Medicine* 47:1231-46.
- Preston, S.H. and P. Taubman. 1994. "Socioeconomic Differences in Adult Mortality and Health Status." Pp. 279-318 in *Demography of Aging*, edited by L.G. Martin and S.H. Preston. Washington, DC: National Academy Press.
- Rice, M.F. and M. Winn. 1990. "Black Health Care in America: A Political Perspective." *Journal of the National Medical Association* 82:429-37.
- Rogers, R.G. 1995. "Sociodemographic Characteristics of Long-lived and Healthy Individuals." *Population and Development Review* 21:634-640.
- Rogers, R.G., R.A. Hummer, and C.B. Nam. 2000. *Living and Dying in the USA*. New York: Academic Press.

- Rumbaut, R.G. and J.R. Weeks. 1996. "Unraveling a Public Health Enigma: Why Do Immigrants Experience Superior Perinatal Health Outcomes?" *Research in the Sociology of Health Care* 13B:337–91.
- Schwartz, J.E., H.S. Friedman, J.S. Tucker, C. Tomlinson-Keasey, D.L. Wingard, and M.H. Criqui. 1995. "Sociodemographic and Psychosocial Factors in Childhood as Predictors of Adult Mortality." *American Journal of Public Health* 85:1237–45.
- Shaw, M., D. Gordon, D. Dorling, R. Mitchell, and G.D. Smith. 2000. "Increasing Mortality Differentials by Residential Area Level of Poverty: Britain 1981–1997." *Social Science and Medicine* 51:151–53.
- Smith, J.P. and R. Kington. 1997. "Demographic and Economic Correlates of Health in Old Age." *Demography* 34:159–70.
- Teachman, J.D. and M.D. Hayward. 1993. "Interpreting Hazard Rate Models." *Sociological Methods and Research* 21:340–71.
- Whitney, J.S. 1934. *Death Rates by Occupation Based on Data of the United States Census Bureau, 1930*. New York: National Tuberculosis Association.
- Wilkinson, R.G. 1996. *Unhealthy Societies: The Afflictions of Inequality*. London: Routledge.
- Winkleby, M.A., D.E. Jatulis, E. Frank, and S.P. Fortmann. 1992. "Socioeconomic Status and Health: How Education, Income, and Occupation Contribute to Risk Factors for Cardiovascular Disease [see comments]." *American Journal of Public Health* 82:816–20.