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Parental Divorce: Effects on Individual Behavior and Longevity

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Using an archival prospective design, the authors studied associations among parental divorce occurring during participants' childhood, adult psychosocial mediators, and mortality over the life span of a subgroup of participants (N = 1,261) in the Terman Life Cycle Study (1921–1991). Children from divorced families grew up to show a higher risk of premature mortality across the life span. The higher mortality risk for men was explained, in part, when 3 mediating factors were controlled: Men who had experienced parental divorce were more likely to have their own marriages end in divorce, obtained less education, and engaged in fewer service activities. Women who had experienced parental divorce smoked more and were more likely themselves to divorce, both of which predicted higher mortality risk. The findings extend previous work on the negative sequelae of parental divorce to long-term effects on personality and longevity.

During the past two decades, knowledge about the long-term impact of parental divorce on children's behavior has exploded, but the potentially mediating role of personality change has been mostly overlooked. Many studies have recognized the multiple interacting variables surrounding parental conflict and divorce (Amato & Keith, 1991a). Characteristics of the child, characteristics of the parents, family process variables such as conflict, communication, and cooperation, and socioeconomic status (SES) are some of the many factors that have been examined in increasingly sophisticated and complex studies of the effects of parental divorce (e.g., Sandler, Wolchik, Braver, & Fogas, 1991; Sandler, Tein, & West, 1994). One important consequence of parental divorce that has received limited empirical investigation is a change in physical health status: There is reason to believe that parental divorce has an important, long-term, deleterious effect on physical health. Because health involves a dynamic process, affected by multiple events across time, health effects are likely interwoven with long-term changes in personality.

The experience of parental divorce and parental conflict or distress has been linked to poorer health among children and adolescents (Gottman & Katz, 1989; Guidubaldi & Cleminshaw, 1985; Mechanic & Hansell, 1989) as well as poorer self-reported health in adulthood (Glenn & Kramer, 1985; Kulka & Weingarten, 1979). This body of literature points to the possibility that experiencing parental divorce or severe parental conflict during childhood changes behavior patterns in a way that has significant and continuing long-term effects on physical health and mortality risk. Indeed, given known associations between personality and disease (Friedman, 1990, 1991, 1992), if parental divorce has significant effects on a child's coping patterns

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This article is one of a series developed from our large-scale, multiyear, multidisciplinary project on psychosocial predictors of health and longevity. Previous publications from our project are cited where appropriate, and care should be taken not to include overlapping findings in meta-analyses or other reviews. Note also that sample sizes may vary somewhat from article to article, as old data are refined, new data gathered, or time periods changed.

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and lifestyle, then effects on long-term health should be readily apparent. However, most studies to date have been cross-sectional or have relied on potentially biased self-report or parent-report measures of health status. One prospective study that used a more objective measure of health found no association between parental divorce prior to age 21 and tumor growth later in life but did not investigate whether parental divorce predicts other diseases or overall health (Duszynski, Shaffer, & Thomas, 1981). To understand long-term behavior patterns more fully, it is important to further investigate whether parental divorce and conflict are associated with objectively measured health and mortality-risk outcomes and to explicate causal linkages across the lifespan.

The best evidence to date of the long-term health effects of parental divorce comes from a study (Schwartz et al., 1995) that used data from the 70-year Terman Life Cycle Study. This study found a significantly higher mortality risk for those who had experienced parental divorce prior to age 21 compared with adults who had not experienced parental divorce, with an approximately 4-year difference in average expected life span between these two groups. It is important to note that this study was able to rule out a number of plausible third-variable explanations for the association between parental divorce and mortality risk. The higher mortality risk of people from divorced families could not be explained by childhood health status or family SES. Similarly, the higher mortality risk of these individuals could not be explained by childhood personality traits, such as impulsivity and emotional instability. The finding that parental divorce predicted mortality risk independently of these childhood personality traits is important because it suggests that the life outcomes associated with parental divorce and conflict are not simply due to preexisting characteristics of these children prior to the divorce. This finding, coupled with the fact that the sample is composed of children chosen by their teachers on the basis of academic excellence and achievement (see Method section for further information on sample selection), also argues against a simple hereditary explanation—that these children were "bad seeds" who, because of their deviant or problematic temperament, both caused their parents' divorce and were at higher mortality risk. Last, consistent with previous research (Tennant, 1988), a comparison group of children who had lost a parent to death were not at higher mortality risk compared with children who had not lost a parent to death (Schwartz et al., 1995), indicating that something about divorce, rather than parental loss, predicts mortality risk.

Although little attention has focused on why the experience of parental divorce has a long-term, detrimental effect on physical health, it may be that the child victims of this conflict set off down life pathways that are significantly less healthy. The literature on social support provides some related possible models. Over the past 20 years, numerous studies have shown that various aspects of social support, such as being socially isolated, losing an important social tie (e.g., bereavement), having problematic relations with others, or being dissatisfied with one's relationships, are associated with higher morbidity and mortality risk (see reviews by Cohen & Syme, 1985; House, Landis, & Umberson, 1988). Focusing on the physiological links of social support with these health outcomes, a growing body of research has found that aspects of social support are associated with cardiovascular, endocrine, and immune system functioning (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). When long-term effects are involved, there is presumably some significant manifestation in personality.

The familial support system of children who have experienced parental divorce may be impaired in a number of respects. Children from divorced families may be exposed to more frequent and intense parental conflict when compared with children who have not experienced parental divorce. Not only can witnessing parental conflict be extremely stressful for the child, but parental conflict can have a secondary effect on the child in terms of the parent–child relationship. There appears to be a spillover effect from the quality of the parents' marital relationship to the quality of the parent–child relationship; parents in distressed marriages are more likely to have problematic relationships with their children than are parents in more stable marriages (e.g., Amato & Booth, 1996; Erel & Burman, 1995). Children from divorced families also experience structural changes in their support system. With the divorce-related relocation of one parent, the child's time is often split between two households. This change not only can lead to less extensive interaction between the child and the parents but also may have a damaging effect on relationship quality. From a social learning perspective, it might also be expected that children from divorced families have less understanding of healthy relationships or do not learn the basic interpersonal skills to allow them to establish and maintain satisfying relationships. Thus, they may have long-term problems with interpersonal relationships both within and outside the family.

Several general models have been proposed to describe how the lack of important social ties or impaired social relationships can have a detrimental effect on physical health (Cohen, 1988). First, there may be an association through behavioral mechanisms. The morbidity and mortality risks associated with unhealthy behaviors such as smoking (U.S. Department of Health and Human Services, 1989) and excessive alcohol consumption (U.S. Department of Health and Human Services, 1990) are well established. Children who experience parental rejection as a result of a divorce may find solace in peers and hence be particularly susceptible to peer influence. If the peer group engages in unhealthy behaviors, the result might well be an increased likelihood of smoking and use of alcohol. Alternatively, an impulsive and aggressive style developed in response to marital conflict may also lead to a willingness to flaunt authority and try cigarettes and alcohol. There is some support for this model in that substance use is more prevalent among children who have experienced parental divorce than among children who have not experienced parental divorce (e.g., Doherty & Needle, 1991). At least some of these unhealthy behaviors appear to continue into adulthood. Recent work using data from the Terman Life Cycle Study has shown that parental divorce prior to age 21 predicted adult smoking in this sample but not alcohol consumption (Tucker et al., 1995). The lack of association between parental divorce and alcohol use may be due to the institution of prohibition, which began in 1920, when participants were an average of 10 years old, and continued

through 1933, thus covering the high-risk period of adolescence and college years in the participants.

Social support may also be linked with physical health through psychological mechanisms. Children who have experienced parental divorce have poorer psychological adjustment (e.g., more depression and anxiety) compared with children who have not experienced parental divorce (see meta-analysis by Amato & Keith, 1991b). These problems in psychological adjustment among individuals who have experienced parental divorce appear to continue into adulthood (e.g., Glenn & Kramer, 1985; Kulka & Weingarten, 1979). In turn, there is now substantial evidence that physical health can be compromised by a variety of psychological mechanisms, such as depression, anxiety, and low sense of control over one's environment (Adler & Matthews, 1994; Friedman, 1990, 1991), although the causal pathways remain murky. Thus, differences in psychological adjustment may account at least partially for the higher mortality risk associated with parental divorce.

Parental divorce may be associated with mortality risk through continuing problems in social functioning. Children from divorced families have poorer social adjustment (e.g., are less popular and cooperative) compared with children who have not experienced parental divorce, although the differences tend not to be large (Amato & Keith, 1991b). These problems appear to continue into adulthood. A recent meta-analysis found poorer social functioning among adults who had experienced parental divorce (Amato & Keith, 1991a). In addition, individuals who have experienced parental divorce are more likely to have marriages that end in divorce (e.g., Anthony, 1974; Glenn & Kramer, 1987; Kulka & Weingarten, 1979; McLanahan & Bumpass, 1988; Pope & Mueller, 1976; Sorosky, 1977). As previously discussed, this impaired social functioning among individuals from divorced families may be due to the lack of early role models for how to establish and maintain healthy relationships. The further link to mortality comes from numerous studies indicating that individuals who are socially isolated or who have experienced marital breakup have a higher mortality risk compared with more socially integrated individuals (e.g., Berkman & Syme, 1979; Carter & Glick, 1976; House, Robbins, & Metzner, 1982; Koskenvuo, Kaprio, Lonnqvist, & Sarna, 1986; Schoenbach, Kaplan, Fredman, & Kleinbaum, 1986). Current sample evidence has similarly shown that divorced individuals have a higher mortality risk than married individuals (Tucker, Friedman, Wingard, & Schwartz, 1996).

These problems in social support may be associated with physical health through stress and coping mechanisms (Cohen, 1988). The stress-buffering model of social support (Cohen & Wills, 1985), for example, proposes that the effects of stress are more severe and damaging among individuals with less social support. These individuals may experience events as more stressful or may be more adversely affected by stressful events. It is also possible that limited or impaired relationships not only may fail to buffer individuals from the effect of stressful events but may themselves be a significant source of stress. This stress may impact physical health by affecting immune system functioning (Cohen & Williamson, 1991) or other physiological mechanisms.

It is also the case that individuals who experienced parental divorce during childhood generally have lower educational achievement and fewer financial resources in adulthood than those who have not experienced parental divorce (Keith & Finlay, 1988; McLanahan, 1985). In terms of educational achievement, academic performance may suffer if the child is experiencing stress or acting rebelliously as a result of the parental conflict or divorce. The parents may be less likely to carefully monitor the child's performance in school. There may be fewer financial resources available for college. Educational attainment and other indicators of SES, in turn, are important and consistent predictors of both morbidity and mortality risk (Haan, Kaplan, & Camacho, 1987; Kitagawa & Hauser, 1973; Marmot, Kogevinas, & Elston, 1987). Although the association between SES and health has been studied mostly at the lower SES levels, there is evidence that such a relationship exists at all levels of SES (Adler et al., 1994). Therefore, the relationship between parental divorce and mortality risk may be partially due to differences in adult SES. In the present study, cumulative education as of 1950 was used as an indicator of SES. However, SES in childhood (as measured by parents' education and father's occupation) did not predict longevity in this sample (Schwartz et al., 1995). Thus, any mediation effects of adult SES likely would be the result of individual failures in socioeconomic achievement (perhaps influenced by family stress) rather than a direct effect of childhood poverty.

In summary, children from divorced families often experience conduct and behavioral problems, academic difficulties, emotional distress and problems in coping, and interpersonal difficulties with family and peers (e.g., Amato & Keith, 1991b; Guidubaldi, Perry, & Nastasi, 1987; Hetherington, Cox, & Cox, 1985; Hetherington, Stanley-Hagan, & Anderson, 1989; Wallerstein, 1984, 1985). Some of these difficulties most likely predate the divorce by several years, being the result of intense or frequent family conflict (Block, Block, & Gjerde, 1986; Cherlin et al., 1991). These childhood difficulties may very well continue throughout adulthood, impacting the individual's opportunities and choices in important ways. Caspi and his colleagues, for example, found that children who had problems with ill-temperedness and shyness in late childhood continued to experience difficulties over a 30-year period. These characteristics had long-term effects on their career choice and mobility, marital stability, and child-rearing patterns (Caspi, Elder, & Bem, 1987, 1988). They theorize that two mechanisms are responsible for the maintenance of childhood characteristics throughout adulthood and the effects they have across the life course. Individuals tend to select or construct environments that serve to reinforce and sustain their personal characteristics, such as ill-temperedness or shyness (which Caspi et al. term *cumulative continuity*). Through self-confirming processes, individuals also tend to interact with others in ways that maintain their personal characteristics (which they term *interactional continuity*). A child who has interpersonal difficulties caused by chronic exposure to family conflict might therefore grow up to have a series of unsuccessful romantic relationships, an experience that further reinforces and sustains these interpersonal difficulties. From this viewpoint, the psychosocial and behavioral difficulties associated with experiencing parental conflict and divorce may lead individuals down a destructive path that ultimately results in higher mortality risk.

The present study investigated the extent to which several adult outcomes relevant to health-related behaviors, psychological adjustment, social relationships, and SES mediate the relationship between parental divorce and mortality risk. A second approach, examining cause of death, was also used to understand the higher mortality risk of those who have experienced parental divorce. Does parental divorce predict equally to different causes of death, or are individuals who have experienced parental divorce more susceptible to a particular cause of death? For example, individuals who have experienced parental divorce may be more likely to die from accident or injury than from other causes. If so, this suggests that their higher mortality risk may be the result of an impulsive or reckless lifestyle. The present study was conducted with bright, capable children who were not subject to extremes of poverty, ignorance or other relevant deprivations. This allowed us to exclude childhood economic and structural impediments to good health and to focus instead on the psychosocial relations between parental divorce and adult health over the course of the life span.

Method

Participants

Participants in the original, full sample were 1,528 individuals (856 men and 672 women) who participated in the Terman Life Cycle Study (formerly called the Gifted Children Study), which began in 1921 (Terman & Oden, 1947). The average year of birth for the participants was 1910, and their average age at the start of the study was 11.7 years for boys and 11.2 years for girls. Participants were generally selected for the study from sampling schools in California for bright children. Teachers were asked to identify the three brightest children in their class, the youngest child in their class, and the brightest child in their class the previous year. These children were then administered intelligence tests, and those with IQs of at least 135 were invited to join the study. The sample is homogeneous in terms of intelligence level, race (99% of participants were White), and social class (most participants were middle class; Terman, 1925).

Our study initially eliminated 267 participants. We excluded 155 individuals because they were not of primary or secondary school age when data collection began (i.e., they were not born between 1904 and 1915, inclusive). An additional 112 participants were excluded because they either died, dropped out of the study, or were lost to follow-up prior to 1950 (when most of the adult variables used in the present study were assessed). Those who were lost from the Terman study are not known to differ systematically from those who continued to participate (cf. Sears, 1984). These exclusions resulted in a total of 1,261 participants (704 men and 557 women), who were analyzed from 1950 until the date of their death or the most recent date they participated in the study (through 1991). Of the 1,261 participants, 346 men and 184 women died between 1950 and 1991, and their date of death is known. Of the remaining 731 participants, 610 (83%) participated in the 1982 or later waves of data collection. Note that the sample sizes differ for some of the analyses because of missing data on the hypothesized mediator variables.

Information in the Terman archives made it possible to determine whether a participant's parents had divorced prior to the participant reaching 21 years of age. One hundred sixty participants (101 men and 59 women) experienced parental divorce prior to age 21. Seventy-six (48%) of these individuals died between 1950 and 1991. The remaining 1,101 participants (603 men and 498 women) did not experience parental divorce prior to age 21.[1] Four hundred fifty-four (41%) of these individuals died between 1950 and 1991. The percentage of individuals who experienced parental divorce is comparable for those included in the present study (13%) and those excluded from the present study (15%).

Cause of Death

We obtained death certificates for the deceased from state bureaus (Friedman, Tucker, & Martin, 1994). Death certificates were coded for underlying cause of death by a certified nosologist, supervised by our research team's physician–epidemiologist, using the ninth revision of the International Classification of Diseases (ICD-9-CM, 1980). Cardiovascular disease deaths were those coded 400-448. Cancer deaths were those coded 140-239. Deaths from injury (i.e., suicide, accidents, and violence) were those coded 800-999. Deaths from other causes and deaths from unknown causes were also categorized separately, resulting in five cause-of-death categories. For 101 of the 530 deceased participants, no death certificates were obtained, but information provided by next of kin (e.g., letters to the Terman researchers) pertaining to cause of death was available in the Terman files. Physician review of this information allowed classification of 51 of these deaths into the four broad categories (cardiovascular disease, cancer, injury, and other) noted above. The number of deaths from each cause was as follows: 183 (35%) deaths from cardiovascular disease (131 men and 52 women), 171 (32%) deaths from cancer (102 men and 69 women), 39 (7%) deaths from injury (26 men and 13 women), 87 (16%) deaths from all other causes (52 men and 35 women), and 50 (9%) deaths from unknown causes (35 men and 15 women).

Hypothesized Mediating Variables

The selection of the hypothesized mediating variables was guided by three concerns. First, we wanted to investigate midlife outcomes associated with parental divorce. Therefore, we selected our variables from information collected at the 1950 assessment, when participants were approximately 40 years old. Second, on the basis of a review of the relevant literatures, we restricted our choice of hypothesized mediators to a limited set of variables theoretically associated with both parental divorce and health status. Third, we were constrained by the information that Terman and his research team collected in 1950.

Social relationships. We used four variables to assess aspects of the participants' social network and preference for social contact. In 1950, participants were asked to list all of the groups they belonged to (e.g., business organizations and social clubs) and all of their service activities (e.g., community activities, church work, and scouting). The number of group memberships (0, 1, 2 or more) and the number of service activities (0, 1, 2 or more) were calculated from this information. Adult divorce was determined from information collected at each assessment in which participants indicated their current marital status as well as any changes in marital status since the last assessment. On the basis of this marital history information, we determined whether participants had divorced prior to the 1950 assessment (when average age was about 40 years). Last, in 1950 participants were asked to rate the extent to which they enjoyed social contacts, using an 11-point scale (1 = *definitely unsocial, prefer to work and play alone;* 11 = *socially minded to an extreme, prefer to be with people most of the time*).

[1] Some of the individuals (approximately 15%) whom we classified as having experienced parental divorce actually had experienced the separation of their parents, but not divorce. The choice of separation, rather than divorce, may have been due to the stigma or religious prohibition of divorce at the time. The association between parental divorce and mortality risk was strengthened when these cases were excluded, but the overall results did not change.

Cumulative education. Cumulative education, as of 1950, was determined for each participant. Education ratings ranged from 1 (*1 year of high school*) to 18 (*10 years of postgraduate education*).

Psychological well-being. Three aspects of psychological well-being were examined. The first is the extent to which participants had a history of psychological problems (termed *mental difficulty*) as of 1950. At several assessment periods, participants were asked whether there had been any "tendency toward nervousness, worry, special anxieties, or nervous breakdown." If there had been, they were asked to explain the situation. On the basis of their descriptions and information from other sources, one of the Terman researchers rated, on a 3-point scale, the degree to which each participant had ever experienced mental difficulty as of 1950 (0 = *no difficulty,* 1 = *some difficulty,* 2 = *considerable difficulty*). Second, a scale measuring general psychological adjustment was developed from six self-report items, which the participants rated on 11-point scales during the 1950 assessment (a higher score indicates more of the trait): happiness of temperament, self-confidence, easy to get along with, moodiness (reverse coded), feelings of inferiority (reverse coded), and sensitive feelings (reverse coded). These items were standardized and averaged to form the psychological adjustment scale (Cronbach's $\alpha = .73$). The final measure of psychological well-being pertains to life satisfaction. In 1950, participants were asked to indicate, for each of the following domains, whether they derived satisfaction: work, recognition for accomplishments, income, avocational activities or hobbies, marriage, children, religion, social contacts, and community services. The number of these domains in which participants indicated receiving satisfaction was calculated, resulting in a variable ranging from 0 to 9.

Health behaviors. Smoking information was obtained by the current investigators during 1991–1992. If participants were alive and could be located, they were sent a postcard asking whether they smoked cigarettes, the number of years they had smoked, and the average number of cigarettes per day they smoked during those years. If participants were not alive or could not be located, a close relative was sent a postcard requesting the same information. Not all participants or families could be contacted. As a result, the sample size for analyses involving the smoking measure is smaller, and there is the potential for bias in this subsample: Because those who chain-smoked and died young were less likely to be located, the mediating effect of smoking may be underestimated. The number of "pack years" was computed for each participant as (number of years smoked × average number of cigarettes per day smoked during those years)/20. This variable was recoded into a four-category smoking variable, where 0 = *never smoke,* 1 = *0.01–16 pack years,* 2 = *16.01–44 pack years,* 3 = *44.01–180 pack years.*

In a previous study, we investigated the association between parental divorce and alcohol consumption (Tucker et al., 1995). Alcohol consumption was assessed in 1950 and 1960. At both decades, participants were classified into one of three categories: abstainers (never taking a drink or drinking only on rare occasions), light to moderate drinkers (never or seldom intoxicated), or heavier drinkers. We used the rating, from either 1950 or 1960, that indicated the greater alcohol consumption as an indicator of alcohol intake for each participant. Results indicated no significant difference on adult alcohol consumption between those who did and those who did not experience parental divorce. However, as previously discussed, this may have been due to the intervention of prohibition (1920–1933). Alcohol consumption is not further considered in the present study.

The distributions of these hypothesized mediator variables are shown in Tables 1 and 2.

Analyses

The present study used hazard regression analysis, which is a form of survival analysis. Specifically, Cox's proportional hazards regression model was used for the analyses predicting to cause of death and overall mortality risk. Cox's widely used proportional hazards model makes no assumption about the underlying hazard function but does assume that the effect of each explanatory variable is multiplicative and constant across age. These analyses were replicated using the Gompertz (parametric) model, which is less flexible with respect to the hazard function but permits a test of whether the effects vary as a function of age. Both types of analyses yielded similar results; all presented results come from Cox models unless otherwise indicated. The RATE program was used for these analyses (Tuma, 1980).

The analyses of the mediator models proceeded in the following order (consistent with recommendations by Baron and Kenny, 1986). First, we conducted statistical tests to determine whether significant differences existed between those who experienced parental divorce and those who did not experience parental divorce on each of the nine hypothesized mediating variables. Second, for each of the variables that differentiated between the parental divorce groups, we conducted separate hazard regression analyses to determine whether these variables were significant predictors of mortality. For those variables that both differentiated between the parental divorce groups and predicted mortality (using a criterion of $p < .10$), a further set of hazard regression analyses was conducted. The association between parental divorce and mortality risk was examined after controlling separately for each of the hypothesized mediators and after simultaneously controlling for all of the hypothesized mediators. All analyses were conducted separately for men and women, unless otherwise indicated.

Results

Parental Divorce and Mortality Risk

An age-adjusted Cox proportional hazards regression analysis predicting mortality from parental divorce showed that men who had experienced parental divorce had a significantly higher mortality risk than men who had not experienced parental divorce ($n = 704$, RH = 1.44, $p < .05$, 95% confidence interval [CI] = 1.08–1.93).[2] Further, an analysis using the Gompertz hazard function revealed a significant Age × Parental Divorce interaction for men ($n = 704$, $p < .05$). Because the implicit dependent variable in hazard regression analysis is the log of the hazard rate (just as the log of the odds ratio is the implicit dependent variable in logistic regression), our fitting of a multiplicative Age × Parental Divorce interaction term results in the two lines shown in Figure 1. According to the parameter estimates, the relative mortality risk for those whose parents divorced during childhood is about 3 at age 40, is about 2 at age 53, is 1.5 at age 63, and diminishes to 1.0 by age 78 (81 is the maximum possible age for someone born in 1910). It is important to note that although the hazard rates become virtually identical when people reach older ages, differences in the estimated cumulative risk of mortality increase steadily until age 70 and diminish only gradually thereafter. There was a trend for women who had experienced parental divorce to have a higher mortality risk than women who had not experienced parental divorce, although this association was not statistically significant ($n = 557$, RH = 1.40, *ns,* 95% CI = .89–2.19). There was not a significant Age × Parental Divorce interaction for women.

[2] RH refers to relative hazard, which is the relative risk of dying in any given year.

Table 1
Distribution of Adult Divorce, Mental Difficulty, and Smoking Variables by Parental Divorce and Gender

	Men				Women			
	No parental divorce		Parental divorce		No parental divorce		Parental divorce	
Variable	*n*	%	*n*	%	*n*	%	*n*	%
Adult divorce								
None	429	83	58	73	328	82	33	69
At least once	88	17	22	28	72	18	15	31
	$\chi^2(1, N = 597) = 5.06$*				$\chi^2(1, N = 448) = 4.81$*			
Mental difficulty								
None	404	73	58	64	312	69	27	52
Some	108	20	22	24	109	24	19	37
Considerable	39	7	11	12	29	6	6	12
	$\chi^2(2, N = 642) = 4.32$				$\chi^2(2, N = 502) = 6.60$*			
Smoking (pack years)								
None	113	34	11	26	146	46	7	22
1–16	68	21	10	23	61	19	9	28
16.01–44	75	23	11	26	54	17	4	13
44.01–180	73	22	11	26	59	18	12	38
	$\chi^2(3, N = 372) = 1.32$				$\chi^2(3, N = 352) = 10.56$**			

* $p < .05$. ** $p < .01$.

Finally, a Gender × Parental Divorce interaction term was added to a full-sample model that predicted mortality from age and parental divorce. Results indicated no significant gender difference in the association between parental divorce and mortality (n = 1,261, RH = .97, *ns*). These results are consistent with the findings from our previous analyses, which did not exclude those who died or dropped out between 1930 and 1950 (see Schwartz et al., 1995).

Cause of Death

When investigating whether a certain variable predicts to a particular cause of death, one can use two different approaches. One approach treats the problem as a simultaneous multiequation system. This permits a test of whether the effect of a predictor is invariant across different causes of death. A second approach treats each cause of death independently, examining the predictive power of the variable in question as it relates to each cause of death. Thus, the questions of whether a variable predicts to cancer death, cardiovascular death, or injury death are asked individually with a goal of identifying causes of death for which the predictive power of the variable is significantly greater than zero.

Table 3 summarizes the fit of two Cox models predicting cause of death, which corresponds to the first approach described above. Model 1 predicts mortality from parental divorce but constrains parental divorce to have the same effect on all causes of death. Model 2 relaxes this constraint, allowing parental divorce to have a different effect on each cause of death. A model that constrains parental divorce to predict equally to all causes of death (Model 1) is a more parsimonious (albeit potentially erroneous) model than one in which parental divorce is not constrained to predict equally to all causes of death (Model 2). A comparison of Model 1 and Model 2 addresses the issue of whether parental divorce predicts equally or differentially to the various causes of death. The difference between chi-squares in Model 1 and Model 2 was not statistically significant for either men or women, suggesting that there is little to be gained from allowing parental divorce to be differentially related to the five cause-of-death categories. Results of these analyses thus indicated that people who had experienced parental divorce as children were more likely to die in any given year, but this effect is not specific to any of our five broad cause-of-death categories.

We also predicted to each cause of death separately, a method that corresponds to the second approach described above (results are not shown). The separate effect of parental divorce on cardiovascular disease, cancer, and injury was examined by estimating separate Cox regressions. Results indicated that men who had experienced parental divorce were more likely to die from injury (RH = 2.59, $p < .05$, 95% CI = 1.08–6.21), although this was not true of women. We further explored this association for men by estimating a Cox regression in which we eliminated men who died of injury from the sample and predicted overall mortality risk from parental divorce for men who died from all causes except injury. Results indicated that the risk associated with parental divorce dropped by about 18% (from RH = 1.44, $p < .05$, 95% CI = 1.08–1.93, for all men, to RH = 1.36, $p = .05$, 95% CI = 1.00–1.86, after we excluded men who had died from injury). Results thus indicate that deaths from injury account for part, but not all, of the excess mortality risk for men. The fact that the relative hazards for most of the cause-of-death analyses exceeded 1.0, coupled with the fact that a relatively small percentage (8%) of men within this sample

Table 2
Distribution of Group Membership, Service Activities, Enjoyment of Social Contacts, Cumulative Education, Psychological Adjustment, and Life Satisfaction Variables by Parental Divorce and Gender

Variable	Men		Women	
	No parental divorce	Parental divorce	No parental divorce	Parental divorce
Group membership				
n	530	86	429	49
M	1.53	1.41	1.14	0.84
SD	0.73	0.80	0.84	0.87
	$t(614) = 1.45$		$t(476) = 2.43$*	
Service activities				
n	524	85	422	49
M	0.67	0.38	1.07	1.04
SD	0.80	0.71	0.87	0.89
	$t(607) = 3.14$**		$t(469) = 0.19$	
Enjoyment of social contacts				
n	481	73	400	46
M	5.84	5.88	6.19	5.98
SD	1.83	1.93	1.66	1.76
	$t(552) = -0.18$		$t(444) = 0.81$	
Cumulative education[a]				
n	545	90	447	50
M	8.81	7.74	7.91	6.92
SD	2.61	2.74	2.13	2.38
	$t(633) = 3.57$***		$t(495) = 3.08$**	
Psychological adjustment				
n	483	74	403	46
M	3.14	3.05	3.08	3.06
SD	0.51	0.57	0.51	0.56
	$t(555) = 1.48$		$t(447) = 0.25$	
Life satisfaction				
n	478	70	398	44
M	4.24	3.97	3.91	3.84
SD	1.80	1.78	1.61	2.07
	$t(546) = 1.18$		$t(440) = 0.21$	

[a] A college graduate would score 8 on cumulative education.
* $p < .05$. ** $p < .01$. *** $p < .001$.

died from injury, helps to explain why the heterogeneity in the effect of parental divorce on specific causes of death (shown in Table 2) is not statistically significant. Because parental divorce was not found to be differentially related to cause of death, only total mortality is considered in subsequent analyses.

Parental Divorce and Hypothesized Mediator Variables

As shown in Tables 1 and 2, both men and women who had experienced parental divorce had fewer years of education and were more likely to divorce in adulthood (as of 1950) compared with individuals who had not experienced parental divorce. Men who had experienced parental divorce also engaged in fewer service activities compared with men who had not experienced parental divorce. In contrast, women who had experienced parental divorce also reported fewer group memberships, greater mental difficulty, and more smoking compared with women who had not experienced parental divorce. There were no differences between the parental divorce groups in enjoyment of social contacts, life satisfaction, and psychological adjustment.

Hypothesized Mediator Variables and Mortality

Only those hypothesized mediator variables that differentiated between individuals who had and had not experienced divorce were investigated in terms of their associations with mortality risk. As shown in Table 4, each of the three variables that differentiated between the parental divorce groups for men (adult divorce, cumulative education, and number of service activities) was also associated with mortality risk, although the association involving service activities was only marginally significant. Specifically, an increased mortality risk for men was associated with having experienced divorce, having attained less education, and being involved in fewer service activities. Although cumulative education was not a significant predictor of mortality for women, both adult divorce and smoking were associated with a higher mortality risk.

Multivariate Analyses

Only the hypothesized mediator variables that both differentiated between the parental divorce groups and predicted mortality risk were included in these analyses. In the case of men, the analyses were limited to those who were not missing information on any of the relevant hypothesized mediating variables (adult divorce, cumulative education, and number of service activities), resulting in a sample size of 560 for these analyses. Table 5 shows that the relative hazard associated with parental divorce using this smaller sample (RH = 1.48, $p < .05$, 95% CI = 1.05–2.07) is comparable to that obtained with the larger sample. This table also shows the change in the relative hazard associated with parental divorce after controlling separately for each of the relevant mediators, as well as after simultaneously controlling for all of the mediators. The risk associated with parental divorce for men was reduced by 17% after controlling for adult divorce, reduced by 13% after controlling for cumulative education, and reduced by 8% after controlling for the number of service activities.[3] Together, controlling for these three mediators reduced the risk of parental divorce for men by 29%, resulting in the association between parental divorce and mortality risk becoming marginally statistically significant.[4]

[3] The following formula was used to calculate the proportionate reduction toward a baseline of 1.00 in the relative hazard: $(RH_1 - RH_2)/(RH_1 - 1.00)$.

[4] For men only, the mental difficulty variable was marginally associated with parental divorce, $\chi^2(N = 642) = 4.32$, $p < .12$, and was a significant predictor of mortality risk ($n = 642$, RH = 1.30, $p < .01$). In the subsample of men who also had information on the other three mediators (adult divorce, education, and service activities), controlling only for mental difficulty reduced the association between parental divorce and mortality risk by 9% ($n = 557$, from RH = 1.47 to RH = 1.43). Controlling for the mental difficulty, adult divorce, education, and service activities reduced the association between parental divorce and mortality risk by 31% (from RH = 1.47, $p < .05$, to RH = 1.32, $p > .10$).

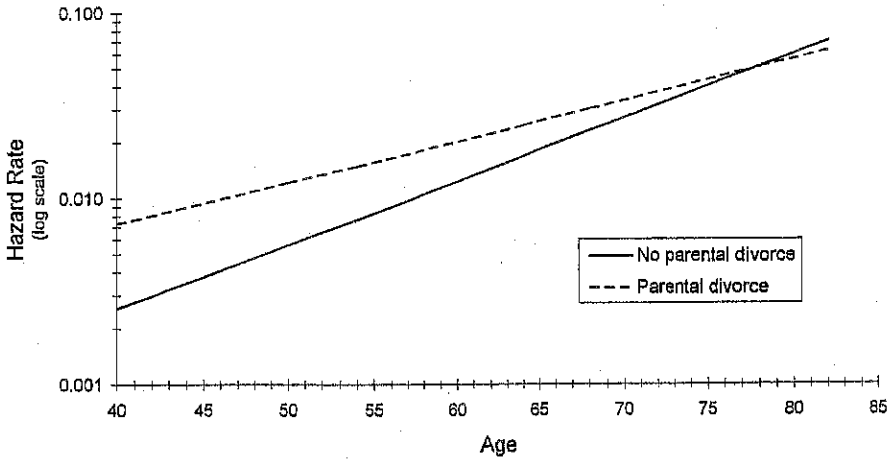

Figure 1. Hazard rate for dying, by age (in years) and parental divorce (men).

Only two variables both differentiated between the divorce groups and predicted mortality risk for women: adult divorce and smoking. Because of the large reduction in sample size among those with smoking information and the reduced association of parental divorce and mortality risk in this subsample, we examined the mediating effects of adult divorce and smoking separately. Controlling for adult divorce reduced the mortality risk associated with parental divorce for women by 20%. For the subsample of women who had information on smoking, the association between parental divorce and mortality risk was not as strong as for the full sample of women ($n = 352$, RH = 1.23, *ns*). However, as shown in Table 5, controlling for smoking eliminated this association.

Discussion

Studies of behavioral risks of experiencing parental divorce implicitly assume an effect on personality, but the long-term impacts have not previously been studied in a comprehensive longitudinal design. Why did the children in the Terman sample who had experienced parental divorce have a significantly higher mortality risk in adulthood? This question was addressed in two ways. First, we explored whether those who had experienced parental divorce were more at risk of dying from certain causes than others. Second, we determined the extent to which parental divorce was associated with certain adult characteristics that, in turn, predicted mortality risk. Both approaches provided insights into the mechanisms through which parental divorce affects mortality risk, suggesting that psychosocial difficulties associated with parental divorce may lead individuals down a destructive path that ultimately results in higher mortality risk.

In terms of cause of death, there was a significant association between parental divorce and death from injury for men (involving deaths from suicide, accident, or violence). However, the number of men who died from injury is small, and deaths from injury could not completely account for the higher mortality risk of men who had experienced parental divorce. The association between parental divorce and deaths from injury for men is

Table 3
Goodness of Fit for Two Cox Models Predicting Cause-Specific Mortality From Parental Divorce

	Men ($n = 704$)		Women ($n = 557$)	
Model	χ^2	*df*	χ^2	*df*
Model 1[a]	5.59*	1	1.98	1
Model 2[b]	9.00	5	3.27	5
Model 2 vs. Model 1	3.41	4	1.29	4

[a] Model 1 predicts mortality from parental divorce, constraining the effect of parental divorce to be equal across all causes of death. [b] Model 2 predicts mortality from parental divorce, not constraining the effect of parental divorce to be equal across all causes of death.
* $p < .05$.

Table 4
Age-Adjusted Association of Hypothesized Mediator Variables and Mortality by Gender

Hypothesized mediator	*n*	RH	95% CI
	Men		
Adult divorce	597	1.65***	1.25–2.18
Cumulative education	635	0.92***	0.90–0.96
Service activities	609	0.87†	0.74–1.01
	Women		
Adult divorce	448	1.66**	1.13–2.43
Cumulative education	497	1.01	
Group memberships	478	1.03	
Mental difficulty	502	1.12	
Smoking	352	1.37***	1.14–1.64

Note. RH = relative hazard; CI = confidence interval.
** $p < .01$. *** $p < .001$. † $p < .10$.

Table 5
Changes in Age-Adjusted Relative Hazard for Parental Divorce After Controlling for the Hypothesized Mediators, Cox Proportional Hazards Model

Hypothesized mediator	RH for parental divorce	95% CI	% reduction in RH
Men (n = 560)			
RH for parental divorce	1.48*	1.05–2.07	
Controlling for adult divorce	1.40†	1.00–1.96	17
Controlling for education	1.42*	1.01–1.99	13
Controlling for service activities	1.44*	1.03–2.02	8
Controlling for three mediators	1.34†	0.95–1.89	29
Women (n = 448)			
RH for parental divorce (n = 448)	1.45		
Controlling for adult divorce (n = 448)	1.36		20
RH for parental divorce (n = 352)	1.23		
Controlling for smoking (n = 352)	1.00		100

Note. RH = relative hazard; CI = confidence interval.
*$p < .05$. †$p < .10$.

consistent with results of several studies that have found that boys who have experienced parental divorce are more likely than girls to become impulsive, reckless, and antisocial (e.g., Guidubaldi, Cleminshaw, Perry, & McLoughlin, 1983; Hetherington, Cox, & Cox, 1985). It is quite possible that this behavioral pattern continues into adulthood, as these boys find themselves in environments that serve to reinforce and sustain these actions (Caspi et al., 1987, 1988), ultimately contributing to an increased risk of death from injury. Although the association between parental divorce and mortality risk was not statistically significant for women, the effect size was almost of equal magnitude to the risk found for men. Given the lower statistical significance for women, it was then less likely that one would find specific cause-of-death effects. Indeed, none were found.

Interestingly, gender differences emerged in the variables that mediated the association between parental divorce and mortality risk. Supporting previous research, the present study found that men who had experienced parental divorce were more likely to have their own marriage end in divorce, obtained less education, and were less socially integrated (in terms of their participation in service activities) compared with men who had not experienced parental divorce. Each of these adult variables, in turn, predicted mortality risk for men. On the basis of the present data, these three mechanisms accounted for approximately 30% of the total association of parental divorce and mortality risk in men. Women who had experienced parental divorce were more likely to have their own marriages end in divorce and tended to smoke more than women who had not experienced parental divorce. Adult divorce and smoking were significant predictors of mortality risk for women, accounting for at least a portion of whatever higher mortality risk associated with parental divorce may exist. Thus, it does appear that parental divorce sets off a negative chain of events, which contribute to a higher mortality risk among individuals from divorced homes. This point is further supported by our previous findings that the association between parental divorce and mortality risk cannot be explained by childhood personality or health status (Schwartz et al., 1995). It seems less likely that a simple selection artifact could explain the all-cause mortality risk in children who have experienced parental divorce. More likely, behavioral or psychosocial consequences of parental divorce that have health-damaging effects are involved.

Although the precise causal linkages through which these variables operate are unknown, it may be that they have their ultimate effect on physical health through stress-related mechanisms. For example, higher levels of SES are associated with both fewer stressful life events and lower psychological perceptions of stress (Adler et al., 1994). Similarly, individuals with satisfying social relationships may interpret events as less stressful or deal more effectively with stressful events (Cohen & Wills, 1985). The lives of individuals who have experienced parental divorce appear to be more stressful in a number of ways compared with the lives of individuals who have not experienced parental divorce. Therefore, it is proposed that the higher mortality risk among individuals who have experienced parental divorce is due to a higher level of stress. The stress, in turn, leads to psychophysiological, social, and health behavior consequences, only a few of which were able to be investigated in this study.

It is interesting to note the few adult variables that did not differentiate between those who had and those who had not experienced parental divorce. Those who had experienced parental divorce did not report less enjoyment of social contacts, although experiencing parental divorce was associated with engagement in fewer service activities (for men only), belonging to fewer groups (for women only), and a higher tendency to divorce (for both genders). It is possible that although individuals who have experienced parental divorce are no more or less likely to enjoy interacting with others, they are less likely to become socially involved and have more difficulty maintaining relationships. The measures of life satisfaction and psychological adjustment also did not differentiate between those who had experienced parental divorce and those who had not, although women who had experienced parental divorce were more likely to have a history of mental difficulty. Given previous research showing a long-term association of parental divorce with psychological well-being (see meta-analysis by Amato & Keith, 1991b), the general lack of such associations in the present study was unexpected.

Although the present study investigated the long-term effects of parental divorce, we view this parental divorce variable as a proxy measure of family conflict. In other words, it might be family conflict, rather than the divorce itself, that creates problems for children. Support for this idea comes from at least two longitudinal studies, which have shown that the psychosocial and behavioral problems experienced by boys from divorced families actually exist several years prior to the divorce (Block, Block, & Gjerde, 1986; Cherlin et al., 1991). However, we acknowledge that parental divorce is a rather crude measure of family conflict. There are many continuously married families that experience a high degree of conflict, and there are some

children who have experienced parental divorce without any associated family conflict. Therefore, if a more refined measure of family conflict were used (rather than the crude distinction of divorce vs. no divorce), we hypothesize that these relationships would be even stronger.

It should be noted that two characteristics of this study could limit its generalizability. First, although the homogeneous nature of this sample has certain advantages, this sample is not representative of the U.S. population as a whole. Second, these individuals were initially studied in 1921, a period that differs in many ways from the present. For example, less than 15% of the Terman children experienced parental divorce prior to age 21, whereas an estimated 40% of U.S. children will witness this event (Bumpass, 1984). Such differences raise questions about the extent to which these results are generalizable to individuals at a different point in time, especially in terms of effect sizes. However, the present study was able to replicate several previously documented findings, such as the associations of parental divorce with adult education and marital history.

However, the Terman data set is uniquely suited to address questions regarding the long-term health consequences of parental divorce. Participants in this study were followed for nearly their entire lives, allowing for prospective investigation of the associations between parental divorce, adult life outcomes, and mortality risk. The homogeneous nature of this sample is also an advantage in that it helps to rule out specific alternative causal pathways that might otherwise be considered. For example, this group of bright, mostly middle-class individuals had adequate education, income, housing, medical care, and other resources—the association between parental divorce and mortality risk is probably not due to deficits in these or related areas. Ruling out these alternative explanations allows for a clearer focus on the psychosocial mechanisms that are likely responsible for this association.

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