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Original Contribution

Marital Trajectories and Mortality Among US Adults

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More than a century of empirical evidence links marital status to mortality. However, the hazards of dying associated with long-term marital trajectories and contributing risk factors are largely unknown. The authors used 1992–2006 prospective data from a cohort of US adults to investigate the impact of current marital status, marriage timing, divorce and widow transitions, and marital durations on mortality. Multivariate hazard ratios were significantly higher for adults currently divorced and widowed, married at young ages ($\leq$18 years), who accumulated divorce and widow transitions (among women), and who were divorced for 1–4 years. Results also showed significantly lower risks of mortality for men married after age 25 years compared with on time (ages 19–25 years) and among women experiencing $\geq$10 years of divorce and $\geq$5 years of widowhood relative to those without exposure to these statuses. For both sexes, accumulation of marriage duration was the most robust predictor of survival. Results from risk-adjusted models indicated that socioeconomic resources, health behaviors, and health status attenuated the associations in different ways for men and women. The study demonstrates that traditional measures oversimplify the relation between marital status and mortality and that sex differences are related to a nexus of marital experiences and associated health risks.

health behavior; marital status; mortality; risk factors; social class

Editor's note: *An invited commentary on this article is published on page 556.*

The relation between marital status and health is one of the most established associations in the scientific literature (1–11). Despite the enormous volume of research, the empirical evidence and prevailing discourse is rooted in static conceptions of marital status. In light of dynamic changes to the American family, current marital status has become less informative about long-term marital experiences and their associated risks (12, 13). Prospective studies now identify the importance of marital trajectories in understanding how marital unions and dissolutions affect acute and chronic exposure to health risks, illness, and mortality (4, 14–18). Central to this life-course orientation is the emphasis on personal biographies reflecting long-term patterns of stability and change within and across marital statuses. Marital trajectories are the aggregation of several interrelated components: marital status, timing, transitions, and durations (19). However, to our knowledge, studies have not investigated the associations among the major components of marital trajectories, mortality, and the factors contributing to the associations.

It has become increasingly clear that examining the distinct attributes of marital trajectories is crucial to understanding the factors that link marital status to health. To date, the theoretical explanations of how different marital components relate to mortality are not well formulated in the literature. Evidence suggests that socioeconomic resources, health behaviors, and psycho-physical health status are the key factors mediating the relation between marital status and mortality (5, 7, 20). However, longitudinal research on how these associations unfold over the life course is still in its infancy and remains largely fragmented.

Some studies suggest that early first marriages (timing) are related to greater marital distress and disruption that anchor a life course of relative disadvantage marked by restricted educational attainment and forfeited material resources, particularly among women (21–25). Divorce and widowhood transitions have also been shown to impact health because of the economic toll suffered by women and

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the loss of social control and support that encourage prophylactic lifestyles among men (26–29). Other studies show that the benefits of marriage accumulate as duration of the union increases (4) and that the consequences of marital disruption may dissipate over time (28, 30). Research also suggests that stably married couples have higher income and accumulated wealth than persons who were divorced or widowed (29, 31) and that long marriages encourage healthy behaviors that prevent chronic illness and promote survival, particularly among men (7, 32).

Drawing from more than 50 years of marriage data and nearly 15 years of mortality data from a prospective cohort of US adults, this study disaggregates the age-specific effects of marital trajectories on all-cause mortality. We also examine many of the previously hypothesized factors shown to mediate the relation between marital status and mortality. We examine the associations separately by sex and discuss the implications of the results for future research.

MATERIALS AND METHODS

Study cohort

For analysis, we used nationally representative data from the Health and Retirement Study, a prospective cohort study of 7,706 US households containing at least one person aged 51–61 years in 1992. Details of the multistage sample design, implementation, and response rates are documented elsewhere (33, 34). The baseline sample included 9,824 age-eligible participants from the original study birth cohort (1931–1941) who were interviewed biannually through 2006, providing 8 waves of panel data for analysis. The initial response rate in 1992 was 82%, and the reinterview response rates for 1994–2006 were consistently about 94% on average.

We excluded 603 persons who reported cohabiting or never marrying at the time of the initial interview because marital history was not applicable. We also excluded 344 respondents because of faulty or incomplete information on the beginning and ending dates of marriages, 40 persons reporting 5 or more marriages because the questionnaire design prohibited the timing of first marriage to be identified, and 122 respondents for whom data on the remaining covariates were missing. The analytic sample was consequently restricted to 8,715 persons.

Measures

Prospective and retrospective data were used to reconstruct marital histories for each cohort member from age 15 years. Marital trajectories were measured by using age-specific information from all marital statuses, marriage timing, transitions, and durations. Studies have shown substantial congruence between marital dates reported retrospectively and those reported by the same individuals in a panel design (35). Age-varying measures of the 4 trajectory components included current marital status (married, divorced, or widowed); early and late marital timing (age at first marriage $\leq$18 and $>$25 years, respectively); cumulative number of divorce and widowhood transitions (0, 1, and $\geq$2); and cumulative durations categorized separately for marriage ($<$20, 20–29, 30–39, and $\geq$40 years), divorce (0, 1–4, 5–9, and $\geq$10 years), and widowhood (0, 1–4, and $\geq$5 years). Extensive coding and analyses showed that the current categorizations were the most empirically robust and substantively appropriate. All marital trajectory variables were lagged 1 year to reduce temporal ambiguity when marital events and mortality were reported for the same age.

Several demographic control variables were included in the multivariate models: baseline age (in years) to adjust for differences in exposure to marital history and risks and for potential birth-cohort variations; race (white or nonwhite); ethnicity (Hispanic or non-Hispanic); lives in the South (yes or no); household size (1, 2, or $\geq$3 persons); and ever having children (yes or no). Three sets of risk adjustments were incorporated to account for many of the previously hypothesized associations between marital status and mortality. Socioeconomic status and its resources included educational attainment (years), occupational status (professional/managerial or other), tenure of the longest held job (years), accumulated wealth (in thousands), and health insurance coverage from any source (yes or no). Behavioral risks included smoking status (never, currently, or not currently); alcohol consumption (0, 1–2, or $>$2 drinks/day); vigorous physical exercise 3 or more times per week (yes or no); body mass index ($<$18.5, 18.5–24.9, or $\geq$25.0 kg/m^2); and whether participants reported having a prostate examination (for men), mammogram or Papanicolaou smear (for women), cholesterol test, or influenza shot (yes or no if none reported). Health status variables were number of chronic illnesses (0–6) including hypertension, diabetes, cancer, lung disease, heart disease, and stroke; one or more limitations in activities of daily living including bathing, eating, dressing, walking across a room, and getting in or out of bed (yes or no); and number of depressive symptoms (0–8) according to the abbreviated Center for Epidemiologic Studies Depression Scale. With the exception of age at baseline, race-ethnicity, and education, all covariates vary with age. For respondents lacking data in a follow-up interview, we assumed no change in covariate values during the interval—with the exception of changes occurring with age (e.g., increases in marriage duration)—unless reinterview data indicated otherwise.

Mortality from all causes was the outcome for analysis. Participants who died were identified from the Health and Retirement Study tracking file and the National Death Index. Age at death was calculated for each deceased person to estimate age-specific mortality rates. Subjects who could not be identified as deceased and persons who survived through 2006 were considered censored. Analyses were conducted separately by sex.

Statistical analysis

An age-specific person-year file was constructed from the respondents' cumulative survival time so that each observation was a record for every additional year beyond their age-specific entry at baseline. Parametric hazard models were used to estimate the hazard ratios and 95% confidence intervals of all-cause mortality across age. The parametric models produced more efficient estimates than

Table 1. Baseline Characteristics of Participants in the Health and Retirement Study, United States, 1992–2006

	Total		Men		Women		*P* Value[a]
	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	
No. of age-specific person-years	112,301		51,751		60,550		
No. of persons/no. of deaths	8,715/1,531		4,077/870		4,638/661		
Demographics							
Age, years	55.9 (3.2)		55.9 (3.1)		55.8 (3.2)		0.72
Nonwhite race		19.7		18.0		21.2	<0.001
Hispanic ethnicity		7.1		7.0		7.1	0.92
Lives in the South		41.7		42.2		41.2	0.36
Single-person household		10.0		7.6		12.1	<0.001
Two-person household		46.4		44.4		48.1	<0.001
Multiperson household		43.6		48.1		39.8	<0.001
No children		5.2		6.5		4.0	<0.001
Current marital status							
Married		79.6		87.9		72.3	<0.001
Divorced		13.8		10.3		16.9	<0.001
Widowed		6.6		1.8		10.8	<0.001
Marriage timing							
On time, ages 19–25 years		63.8		68.7		59.6	<0.001
Early, age ≤18 years		17.7		5.1		28.8	<0.001
Late, age ≥26 years		18.4		26.2		11.6	<0.001
Marital transitions							
Divorces							
0		67.2		67.5		67.1	0.69
1		25.8		25.2		26.2	0.26
≥2		7.0		7.4		6.7	0.23
Widowhoods							
0		90.4		95.8		85.8	<0.001
1		9.3		4.2		13.8	<0.001
≥2		0.2		0.0		0.4	<0.001
Marital durations							
Married years							
<20		11.7		10.5		12.7	0.001
20–29		21.8		24.7		19.4	<0.001
30–39		55.8		57.8		54.0	<0.001
≥40		10.7		7.0		13.9	<0.001

Table continues

semiparametric (Cox) hazards models and fully exploited the age-varying marital information (36). Using time-varying age to parameterize the hazard function (37), we evaluated various functional forms using the Akaike Information Criterion (38, 39) and determined that a Weibull distribution was the most efficient and parsimonious. Preliminary analyses using Cox models were essentially the same and assured us of no systematic bias in model specification.

Baseline characteristics of the study cohort were computed for all participants, and comparisons by sex were calculated with *t* tests for continuous and count variables and with χ^2 tests for dichotomous variables (Table 1). The first set of multivariate models tested the associations between mortality and each of the marital trajectory components with demographic control variables. The next set of models examined the risk-adjusted associations between mortality and the trajectory components. All multivariate models used Huber-White sandwich estimators to account for the lack of independence across observations and to reduce unobserved heterogeneity bias. Statistical analyses were conducted by using Stata 9.2 software (40) and were weighted for sample selection and initial nonresponse. *P* values were based on 2-tailed tests and were considered statistically significant at <0.05.

Table 1. Continued

	Total		Men		Women		*P* Value[a]
	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	
Divorced years							
0		67.2		67.5		67.1	0.69
1–4		14.1		16.4		12.1	<0.001
5–9		6.5		6.6		6.4	0.68
≥10		12.2		9.7		14.4	<0.001
Widowed years							
0		90.4		95.8		85.8	<0.001
1–4		4.0		2.6		5.3	<0.001
≥5		5.5		1.7		8.9	<0.001
Socioeconomic factors							
Education, years	12.1 (3.1)		12.3 (3.3)		12.0 (2.9)		<0.001
Professional or managerial occupation		25.8		29.9		22.1	<0.001
Occupational tenure, years	15.2 (10.7)		19.7 (10.2)		11.2 (9.5)		<0.001
Wealth in thousands, $	218.5 (453.8)		230.4 (475.3)		208.1 (433.7)		0.02
No health insurance		21.8		19.2		24.0	<0.001
Behavioral factors							
Never smoked		63.4		54.2		71.4	<0.001
Currently smokes		26.7		28.8		24.8	<0.001
Alcohol consumption, 0 drinks/day		39.5		31.8		46.2	<0.001
Alcohol consumption, ≥3 drinks/day		5.0		8.7		1.7	<0.001
Vigorous exercise ≥3 times/week		19.6		19.8		19.4	0.65
BMI <18.5		1.3		0.4		2.1	<0.001
BMI ≥25.0		63.5		69.4		58.3	<0.001
No preventive care		25.9		30.8		21.6	<0.001
Health factors							
Chronic illnesses, no.	0.7 (0.8)		0.7 (0.9)		0.7 (0.9)		0.40
≥1 ADL limitations		10.3		9.5		11.0	0.02
CES-D Scale depressive symptoms, no.	0.8 (1.4)		0.6 (1.2)		0.9 (1.6)		<0.001

Abbreviations: ADL, activities of daily living; BMI, body mass index (weight in kilograms/height in meters^2); CES-D, Center for Epidemiologic Studies Depression.

[a] *P* values indicate sex differences and were calculated by analysis of variance or χ^2 tests.

RESULTS

Table 2 presents men's risk-adjusted hazard ratios and 95% confidence intervals for the associations between the marital trajectory components and mortality. Results showed that each component of a marital trajectory was significantly related to all-cause mortality after demographic adjustments. Hazard ratios for current status were 2.37 (95% confidence interval: 1.80, 3.12) for divorced men and 1.64 (95% confidence interval: 1.17, 2.30) for widowed men. Adjustments for socioeconomic resources, health behaviors, and health status eliminated the association for widowed men in each model and for divorced men in the final model including all risk factors. Compared with those for men who married on time (ages 19–25 years), hazard ratios were 1.56 (95% confidence interval: 1.18, 2.06) for early marriages and 0.73 (95% confidence interval: 0.61, 0.87) for late marriages, and covariate adjustments had little impact on the associations.

Marital transitions among men were positively related to mortality for divorce but not for widowhood. Men with one divorce were 1.30 times more likely to die than men without a divorce and were 1.80 times more likely to die if they had 2 or more divorce transitions. The significant mortality risk associated with one divorce was eliminated after accounting for socioeconomic status and only slightly reduced after adjustments for behavioral and health factors. The excess risks associated with one or more divorces were not significant in the fully adjusted model.

Mortality risks declined significantly for men with 20–29, 30–39, and more than 40 years of marriage (hazard ratios = 0.71, 0.60, and 0.41, respectively) compared with fewer than 20 years of marriage. Although the largest reduction in the protective effects of marriage duration was attributable to behavioral factors, men who were married for more than 40 years had about a 50% lower risk of death than men with fewer than 20 years of marriage, regardless of nearly 2 dozen

Table 2. Adjusted Hazard Ratios for All-Cause Mortality Associated With Marital Trajectories Among US Men in the Health and Retirement Study, 1992–2006[a]

	Total		Adjusted for SES Risk Factors[b]		Adjusted for Behavioral Risk Factors[c]		Adjusted for Health Risk Factors[d]		Fully Adjusted[e]	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Current marital status										
Married	1.00		1.00		1.00		1.00		1.00	
Divorced	2.37	1.80, 3.12	1.65	1.25, 2.18	1.67	1.26, 2.21	1.90	1.45, 2.50	1.27	0.96, 1.68
Widowed	1.64	1.17, 2.30	1.29	0.92, 1.82	1.26	0.90, 1.76	1.37	0.98, 1.92	1.14	0.81, 1.61
Marriage timing										
On time, ages 19–25 years	1.00		1.00		1.00		1.00		1.00	
Early, age ≤18 years	1.56	1.18, 2.06	1.43	1.08, 1.88	1.45	1.11, 1.89	1.42	1.08, 1.85	1.36	1.05, 1.75
Late, age ≥26 years	0.73	0.61, 0.87	0.72	0.60, 0.86	0.73	0.61, 0.87	0.81	0.68, 0.96	0.78	0.65, 0.93
Marital transitions										
Divorces										
0	1.00		1.00		1.00		1.00		1.00	
1	1.30	1.10, 1.55	1.16	0.98, 1.38	1.24	1.04, 1.47	1.20	1.01, 1.43	1.10	0.92, 1.31
≥2	1.80	1.43, 2.25	1.36	1.08, 1.73	1.53	1.23, 1.91	1.40	1.11, 1.76	1.14	0.89, 1.46
Widowhoods										
0	1.00		1.00		1.00		1.00		1.00	
1	1.15	0.89, 1.48	1.04	0.81, 1.34	1.11	0.87, 1.43	1.04	0.81, 1.34	1.05	0.81, 1.35
≥2	1.74	0.46, 6.64	1.75	0.51, 5.93	1.44	0.41, 5.10	0.99	0.23, 4.26	1.16	0.33, 4.16
Marital durations										
Years of marriage										
<20	1.00		1.00		1.00		1.00		1.00	
20–29	0.71	0.52, 0.96	0.79	0.57, 1.06	0.80	0.59, 1.08	0.80	0.59, 1.08	0.88	0.63, 1.24
30–39	0.60	0.44, 0.82	0.70	0.52, 0.95	0.73	0.54, 1.00	0.65	0.48, 0.88	0.79	0.57, 1.09
≥40	0.41	0.29, 0.59	0.49	0.34, 0.69	0.52	0.36, 0.74	0.42	0.30, 0.60	0.53	0.36, 0.77
Years of divorce										
0	1.00		1.00		1.00		1.00		1.00	
1–4	1.25	1.02, 1.54	1.13	0.92, 1.39	1.20	0.98, 1.47	1.14	0.93, 1.40	1.07	0.87, 1.32
5–9	1.20	0.88, 1.62	1.06	0.79, 1.42	1.17	0.87, 1.57	1.09	0.81, 1.48	0.98	0.73, 1.33
≥10	1.19	0.89, 1.60	1.01	0.76, 1.34	1.10	0.84, 1.47	0.97	0.72, 1.30	0.87	0.65, 1.16
Years of widowhood										
0	1.00		1.00		1.00		1.00		1.00	
1–4	1.04	0.75, 1.45	0.95	0.68, 1.33	0.98	0.71, 1.36	0.87	0.63, 1.21	0.87	0.63, 1.21
≥5	1.25	0.87, 1.79	1.06	0.74, 1.52	1.17	0.82, 1.67	1.09	0.75, 1.60	1.09	0.75, 1.58

Abbreviations: CI, confidence interval; HR, hazard ratio; SES, socioeconomic status.

[a] All models were weighted and were adjusted for age, race-ethnicity, region, household size, and children.

[b] Adjusted for age, race-ethnicity, region, household size, children, education, occupational status, occupational tenure, wealth, and health insurance coverage.

[c] Adjusted for age, race-ethnicity, region, household size, children, smoking, alcohol consumption, physical exercise, body mass index, and preventive health care.

[d] Adjusted for age, race-ethnicity, region, household size, children, number of chronic illnesses (hypertension, diabetes, cancer, lung disease, heart disease, and stroke), any activities of daily living (ADL) limitations, and depressive symptoms (8-item Center for Epidemiologic Studies Depression (CES-D) Scale).

[e] Adjusted for age, race-ethnicity, region, household size, children, education, occupational status, occupational tenure, wealth, health insurance coverage, smoking, alcohol consumption, physical exercise, body mass index, preventive health care, number of chronic illnesses (hypertension, diabetes, cancer, lung disease, heart disease, and stroke), any ADL limitations, and depressive symptoms (8-item CES-D Scale).

risk adjustments. For divorce, the hazards were significantly higher for only the first 4 years of divorce and were fully accounted for with each set of risk factors. Widowhood duration had no impact on mortality among men.

Table 3. Adjusted Hazard Ratios for All-Cause Mortality Associated With Marital Trajectories Among US Women in the Health and Retirement Study, 1992–2006[a]

	Total		Adjusted for SES Risk Factors[b]		Adjusted for Behavioral Risk Factors[c]		Adjusted for Health Risk Factors[d]		Fully Adjusted[e]	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Current marital status										
Married	1.00		1.00		1.00		1.00		1.00	
Divorced	2.04	1.58, 2.64	1.32	1.00, 1.74	1.73	1.34, 2.23	1.62	1.25, 2.10	1.14	0.88, 1.49
Widowed	1.61	1.26, 2.06	1.12	0.87, 1.44	1.33	1.04, 1.69	1.31	1.03, 1.67	0.98	0.77, 1.24
Marriage timing										
On time, ages 19–25 years	1.00		1.00		1.00		1.00		1.00	
Early, age ≤18 years	1.38	1.14, 1.66	1.15	0.95, 1.39	1.28	1.07, 1.54	1.11	0.92, 1.34	1.00	0.83, 1.21
Late, age ≥26 years	1.14	0.87, 1.50	1.09	0.83, 1.43	1.08	0.83, 1.42	1.17	0.89, 1.54	1.02	0.78, 1.35
Marital transitions										
Divorces										
0	1.00		1.00		1.00		1.00		1.00	
1	1.68	1.40, 2.03	1.38	1.14, 1.67	1.54	1.27, 1.86	1.44	1.19, 1.74	1.22	1.01, 1.48
≥2	1.72	1.26, 2.35	1.22	0.88, 1.69	1.46	1.06, 2.00	1.34	0.97, 1.83	1.00	0.72, 1.38
Widowhoods										
0	1.00		1.00		1.00		1.00		1.00	
1	1.29	1.06, 1.58	1.04	0.85, 1.27	1.15	0.94, 1.40	1.12	0.92, 1.37	0.94	0.77, 1.14
≥2	0.56	0.17, 1.88	0.47	0.14, 1.53	0.50	0.15, 1.61	0.49	0.16, 1.49	0.37	0.14, 0.97
Marital durations										
Years of marriage										
<20	1.00		1.00		1.00		1.00		1.00	
20–29	0.74	0.55, 1.00	0.84	0.61, 1.14	0.74	0.55, 1.01	0.83	0.61, 1.12	0.89	0.66, 1.22
30–39	0.70	0.52, 0.95	0.83	0.61, 1.13	0.77	0.57, 1.05	0.77	0.57, 1.04	0.93	0.68, 1.27
≥40	0.37	0.26, 0.53	0.45	0.31, 0.65	0.41	0.29, 0.59	0.39	0.27, 0.55	0.49	0.34, 0.72
Years of divorce										
0	1.00		1.00		1.00		1.00		1.00	
1–4	1.62	1.26, 2.09	1.40	1.08, 1.81	1.49	1.15, 1.93	1.37	1.06, 1.77	1.25	0.96, 1.61
5–9	1.34	0.93, 1.93	1.20	0.84, 1.72	1.22	0.85, 1.76	1.12	0.78, 1.63	0.98	0.68, 1.41
≥10	0.99	0.72, 1.36	0.77	0.55, 1.06	0.93	0.68, 1.28	0.79	0.57, 1.09	0.70	0.51, 0.97
Years of widowhood										
0	1.00		1.00		1.00		1.00		1.00	
1–4	1.19	0.89, 1.59	1.03	0.78, 1.38	1.09	0.82, 1.45	1.05	0.79, 1.41	0.92	0.69, 1.23
≥5	0.91	0.69, 1.20	0.69	0.52, 0.91	0.81	0.62, 1.07	0.74	0.56, 0.98	0.63	0.48, 0.83

Abbreviations: CI, confidence interval; HR, hazard ratio; SES, socioeconomic status.

[a] All models were weighted and were adjusted for age, race-ethnicity, region, household size, and children.

[b] Adjusted for age, race-ethnicity, region, household size, children, education, occupational status, occupational tenure, wealth, and health insurance coverage.

[c] Adjusted for age, race-ethnicity, region, household size, children, smoking, alcohol consumption, physical exercise, body mass index, and preventive health care.

[d] Adjusted for age, race-ethnicity, region, household size, children, number of chronic illnesses (hypertension, diabetes, cancer, lung disease, heart disease, and stroke), any activities of daily living (ADL) limitations, and depressive symptoms (8-item Center for Epidemiologic Studies Depression (CES-D) Scale).

[e] Adjusted for age, race-ethnicity, region, household size, children, education, occupational status, occupational tenure, wealth, health insurance coverage, smoking, alcohol consumption, physical exercise, body mass index, preventive health care, number of chronic illnesses (hypertension, diabetes, cancer, lung disease, heart disease, and stroke), any ADL limitations, and depressive symptoms (8-item CES-D Scale).

Table 3 shows that currently divorced women were twice as likely as married women to die and that widowed women were 1.61 times more likely to die than their married counterparts. Socioeconomic factors showed the greatest reduction of risk associated with divorce and widowhood, and the elevated risks were eliminated entirely after taking into

account all risk factors. For marital timing, hazard ratios were significantly higher for women with early marriages (hazard ratio = 1.38) compared with on-time marriages, and the association was statistically negated after socioeconomic status and health factors were included.

Women with 1 and 2 or more divorce transitions were 68% and 72%, respectively, more likely to die than women without a divorce. Women who were widowed once had about a 30% greater risk of mortality than their nonwidowed counterparts; however, this relation disappeared once risk factors were taken into account. The significant mortality hazards associated with 2 or more divorces were eliminated after accounting for socioeconomic status and health risks and only partially reduced after adjustments for behavioral factors. The excess mortality risk associated with 1 divorce transition remained significant in all models, although the hazard ratio declined most because of socioeconomic factors.

Results for marital duration showed that mortality risks declined significantly for women with 20–29, 30–39, and more than 40 years of marriage (hazard ratios = 0.74, 0.70, and 0.37, respectively) compared with women married for fewer than 20 years. Women married for 40 or more years had about 50%–60% lower risks of dying than women with fewer than 20 years of marriage, regardless of covariate adjustments. The hazards associated with divorce were significantly higher for women for only the first 4 years of divorce, and, unlike men, separate adjustments for risk factors had little impact on the relation. Results also suggested that 5 or more years of widowhood reduced mortality by approximately 30% after accounting for socioeconomic status and health differences among widowed women.

DISCUSSION

This study provides the first known evidence of an association between mortality and more than 50 years of disaggregated marital history. Results from a nationally representative cohort of US adults show that a nexus of marital status, timing, transitions, and durations is associated with mortality. Overall, the findings are consistent with life-course theory suggesting that the influence of marital status on survival is anchored in young adulthood (marriage timing) and impacts health throughout life with the accumulation of marital durations and transitions. Despite many similarities, there are intriguing sex differences in mortality due to differing trajectory components and associated risks. The results also underscore the enduring public health consequences of an increasingly dynamic social institution shared by most adults.

Our results reaffirm the fact that married persons live longer, and they further demonstrate that the health benefits of marriage and the detriments of marital dissolution are more complex than previously shown. We found that every facet of a marital trajectory was associated with mortality. As anticipated, the mortality risks associated with current marital status were highly significant. However, the hazards of divorce for men declined from 2.37 to approximately 1.65 with separate adjustments for socioeconomic resources and behavioral risks. For women, socioeconomic factors alone reduced the hazards of divorce from 2.04 to 1.32 and eliminated the relation between widowhood and mortality. For both sexes, the excess risks associated with divorce and widow status were not significant after accounting for all risk factors. Conceptually, these results support a large body of evidence linking marital status to mortality through its previously hypothesized mechanisms (5–7). Statistically, the modifiable relation between marital status and mortality is not unexpected because current status is generally a crude indicator of marital history and is the most proximate to death. In either case, marital status had the least robust association with mortality compared with other trajectory measures once differences in risk were taken into account.

Our analysis demonstrated that the most distal characteristic of marital history—age at first marriage—had lasting consequences for mortality. Results showed that marrying as a teenager increased the risks of dying by 56% for men and 38% for women. Life-course studies suggest that early marriages are disruptive to normative developmental trajectories (e.g., schooling) and are often marked by untimely parental responsibilities, psychological distress, high rates of divorce, maladaptive behaviors, and economic hardship (21, 24, 25, 41). Our research partially supports this argument for women by showing that teenage marriages were not significantly associated with mortality when either socioeconomic factors or health status was introduced. However, the negative health consequences of early marriage remained significant for men regardless of the model adjustments. Somewhat surprisingly, late marriages significantly reduced men's mortality by approximately 20% compared with the majority of men who married between ages 19 and 25 years. Moreover, there was no evidence to suggest that postponement of marriage enhanced men's socioeconomic resources as a mechanism to reduce mortality. To our knowledge, this study is the first to document a significant relation between late marriage and mortality, and we await further studies to confirm this finding.

Perhaps the most researched aspect of a marital trajectory is the harmful effect of marital dissolution (14, 16, 42, 43). Our findings for divorce mostly corroborate this research and further show that multiple transitions have graded implications for survival. The prevailing argument is that marital loss(es) and instability sever shared resources, cause stress and acute changes in emotional well-being, and bring about unhealthy lifestyles that precipitate chronic disease and mortality (4, 26, 44). Adjustments for socioeconomic resources and health status (for women) partially supported this argument, although the influence of behavioral factors was less apparent. Interestingly, our analyses could not fully account for the increased risk of death for women who experienced one divorce in their lifetime. Considering the results for current status, this finding suggests that the toll of marital dissolution may persist despite women's changes in marital status (or risk profile) over time. It also is possible that divorce transitions operate through other untested mechanisms. For men, we found that a combination of all risk factors fully accounted for the elevated risks of one or more divorces. Unlike previous research, widowhood transitions had relatively little or no impact on mortality. We suspect the discrepancy was largely attributable to the age of study respondents who had limited exposure to the loss of a spouse, especially men.

Marriage duration is the least studied component of marital life; however, in this study, it was one of the most robust factors contributing to mortality differentials. Mortality decreased significantly as the number of years of marriage increased, and the benefits were greatest for adults who accumulated 40 or more years of marriage compared with those with fewer than 20 years. These findings are especially significant given that a third of respondents with 30 or more years of marriage—and more than a quarter of those with 40 or more years—had at least one marital disruption. Therefore, it is plausible that attaining long durations of marriage can be as protective against mortality as maintaining a stable marriage. However, more research is needed to validate this claim.

The healthful effects of marriage duration for men were largely reduced by behavioral factors and moderately reduced by socioeconomic resources and health status. This finding supports the argument that marriage length protects men's health by providing a lasting supportive environment that encourages reduced tobacco use and alcohol consumption, improved diet and exercise, and utilization of preventive care to detect and treat illnesses (4, 26, 32, 45, 46). Women's hazard ratios were attenuated most by socioeconomic factors and less by behavioral and health factors. These findings support the argument that long marriages protect women's health by increasing financial stability, wealth, and the health-purchasing resources needed to access quality health care, pay for costly treatments, and afford prophylactic lifestyles (29, 31, 47). The protective effects of 40 or more years of marriage remained robust and relatively unchanged despite accounting for more than 20 well-documented risk factors. This finding suggests that 1) the economic, behavioral, and health factors are largely independent of the length of the union; 2) the risk factors are not contemporaneously measured with the prior accumulation of marriage duration; or 3) the long-term pathways linking marriage and its mechanisms to mortality are more complex than previously thought. Additional measures of social control, emotional support, and coping mechanisms also may account for some of this robust relation (15, 28, 32, 48, 49). Therefore, our conclusions are cautious, and we encourage future studies to continue investigating why marriage duration delays mortality.

Another important finding was that the negative impact of divorce on mortality was limited to the first few years of dissolution. Adults divorced for only 1–4 years were at greater risk of dying than those with no exposure to divorce. Divorce durations of more than 4 years had no impact. These findings are compatible with studies suggesting that the negative consequences of marital transitions dissipate over time (28, 30, 50). Surprisingly, the fully adjusted results indicated that women who spent 10 or more years divorced and 5 or more years widowed had 30% and 37% *lower* risks of dying than women who did not experience these respective transitions. Although the explanations for these findings require more testing, they coincide with the life-course perspective that individuals adjust to their status(es) and avoid the stress associated with instability.

A limitation of this study is that it included members of only a single 10-year birth cohort who survived to ages 51–61 years. Therefore, we cautiously generalize our findings to the broader population and acknowledge the potential for survival bias. Our study was advantageous from a life-course standpoint because the data minimized misinterpretation of age effects with cohort effects. However, studies should investigate whether the present findings vary across age and other birth cohorts. Furthermore, evidence suggests that ''nonmarital'' experiences of individuals warrant consideration given their unique stressors and risk factors (51, 52). We also acknowledge that our results were estimated separately for each of the marital components and encourage future research to consider the combined and possible interactive effects of marital history on health.

Data limitations prohibited us from evaluating the impact of marital history and risk factors on mortality across all adulthood. Although the risk factors were conceptualized according to the literature as the mechanisms linking marital history to mortality, it is possible that the risk variables also contributed to the respondents' marital experiences. For example, it is unclear whether the negative impact of teenage marriage was a consequence of economic difficulties and poor health (e.g., assortative mating) or whether the hardships associated with early marriage led to financial strain and illness. Therefore, we are guarded in drawing causal conclusions from these analyses. Another limitation is that we considered mortality from all causes. Although studies have shown that some causes of death are associated with certain marital statuses (53–55), it is unclear how marital history contributed to the cause of death. Marital durations may be most salient among older adults because of prolonged exposure to individual and environmental insults that increase the risk of malignant neoplasms, whereas marital transitions may exert more immediate effects that trigger acute cardiovascular events. Studies should investigate these associations by considering multiple causes of death, various marital predictors, and other potential risk factors.

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