Association Between Divorce and Risks for Acute Myocardial Infarction

Matthew E. Dupre, PhD; Linda K. George, PhD; Guangya Liu, PhD; Eric D. Peterson, MD, MPH

Background—Divorce is a major life stressor that can have economic, emotional, and physical health consequences. However, the cumulative association between divorce and risks for acute myocardial infarction (AMI) is unknown. This study investigated the association between lifetime exposure to divorce and the incidence of AMI in US adults.

Methods and Results—We used nationally representative data from a prospective cohort of ever-married adults aged 45 to 80 years (n=15,827) who were followed biennially from 1992 to 2010. Approximately 14% of men and 19% of women were divorced at baseline and more than one third of the cohort had ≥1 divorce in their lifetime. In 200,524 person-years of follow-up, 8% (n=1211) of the cohort had an AMI and age-specific rates of AMI were consistently higher in those who were divorced compared with those who were continuously married (P<0.05). Results from competing-risk hazard models showed that AMI risks were significantly higher in women who had 1 divorce (hazard ratio, 1.24; 95% confidence interval, 1.01–1.55), ≥2 divorces (hazard ratio, 1.77; 95% confidence interval, 1.30–2.41), and among the remarried (hazard ratio, 1.35; 95% confidence interval, 1.07–1.70) compared with continuously married women after adjusting for multiple risk factors. Multivariable-adjusted risks were elevated only in men with a history of ≥2 divorces (hazard ratio, 1.30; 95% confidence interval, 1.02–1.66) compared with continuously married men. Men who remarried had no significant risk for AMI. Interaction terms for sex were not statistically significant.

Conclusions—Divorce is a significant risk factor for AMI. The risks associated with multiple divorces are especially high in women and are not reduced with remarriage. (Circ Cardiovasc Qual Outcomes. 2015;8:244-251. DOI: 10.1161/CIRCOUTCOMES.114.001291.)

Key Words: divorce ■ myocardial infarction ■ sociological factors

Coronary heart disease afflicts nearly half of US men and more than one third of US women >40 years and is the single largest killer of Americans.1,4 According to recent estimates, >1 million adults will have an acute myocardial infarction (AMI) this year (=1 in every 44 secs) and cost the United States nearly $12 billion in hospital expenses.5 Although major risk factors for AMI have been widely documented—eg, smoking, hypertension, diabetes mellitus3,6–9—the associations between social stressors and AMI risks are not well understood. By the age of 50, more than one third of all adults will have divorced and upward of a quarter will have married ≥2 times.10 Although studies have shown that divorce is a major life stressor linked to poor health outcomes,15–17 research has focused almost entirely on the cross-sectional risks related to current marital status and have largely ignored lifetime exposure to divorce and its potential consequences for the cardiovascular health of men and women.13,16,18–22

It is well documented that men have significantly greater risk of AMI than women,1,3,22 and on average, experience their first event 7 years earlier than women (age 65 versus 72, respectively).2 Patterns of divorce and remarriage also differ by sex. For example, men are much more likely to remarry after divorce than women, and among those who remarry, men remarry sooner than women.10,25 There is also evidence to suggest that marital loss has a greater impact on the health of women than men.21,26 particularly cardiovascular health.16 The reasons for these differences are not entirely known; however, studies have shown that divorced women suffer greater economic losses and emotional distress than divorced men16,26–29; alternatively, divorced men lack the social control and obligations of marriage that encourage a healthy diet, moderate alcohol consumption, and the avoidance of smoking.30–32

This study is the first prospective investigation of the cumulative association between divorce and risks for AMI in US men and women. We used data from a nationally representative sample of middle-aged and older adults followed biennially from 1992 to 2010 to examine how marital status and the number of divorces in one’s lifetime were associated with incident AMI. We examined the associations separately in men and women and assessed whether and to what extent...
WHAT IS KNOWN

- Divorce is a major life stressor that can have economic, emotional, and physical health consequences.
- Studies have focused almost entirely on the risks related to current marital status and have largely ignored lifetime exposure to divorce and its potential consequences for the cardiovascular health of men and women.
- The cumulative association between divorce and risks for acute myocardial infarction (AMI) is unknown.

WHAT THE STUDY ADDS

- Nationally representative data from a prospective cohort of never-married US older adults followed from 1992 to 2010 were used to investigate the association between divorce and the incidence of AMI.
- Cumulative exposure to divorce increased risks of AMI in men and women and the associations were not accounted for by socioeconomic, psychosocial, behavioral, or physiological factors.
- Women with multiple divorces were at especially high risk of AMI; remarried women had risks that were similar in magnitude to divorced women.
- Men who remarried had no significant risk for AMI.

MULTIVARIABLE models adjusted for background characteristics that included age at study entry, HRS study cohort (War Baby, Early Baby-Boom, or initial HRS), race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, or non-Hispanic other race), and geographic region (South or other). Several categories of previously identified cardiovascular risks also were examined as possible factors contributing to the associations. Socioeconomic factors included the respondents’ reports of educational attainment (years), primary lifetime occupational status (professional, managerial, or other occupation), employment status (employed, unemployed, or retired), total income in thousands of dollars (logarithmic scale), and health insurance coverage from any source (yes or no). Psychosocial factors included living arrangement (lives alone or not), number of children (no children, ≥1 child), and the number of depressive symptoms measured by the 8-item abbreviated Center for Epidemiologic Studies Depression Scale (range=0–8). Behavioral factors included current smoking status (yes or no), alcohol use (0, 1–2, or ≥3 drinks per day), and vigorous physical exercise (<3 or ≥3 times per week).

Physiological status was also included as body mass index (calculated as weight in kilograms divided by height in meters squared: <18.5 [underweight], 18.5–24.9 [normal weight], 25.0–29.9 [overweight], or ≥30.0 [obese]), hypertension (yes or no), and diabetes mellitus (yes or no). An indicator for whether respondents had ever been widowed (yes or no) also was included.

The covariate data were obtained from baseline and follow-up interviews (every 24 months) and the coding of study measures was facilitated by using HRS data files provided by RAND’s Center for the Study of Aging—funded by National Institute on Aging and the Social Security Administration.34 Missing data were minimal across study variables for follow-up measurements (≤2% to 3%) and preliminary analyses showed that the results were unchanged using multivariable and mean imputation methods. Preliminary analyses also included variables for age at first marriage and spouses from the same HRS household; however, these variables were dropped from the final models because of multicollinearity with other covariates (namely marital variables). Alternative coding strategies were also assessed for the continuous variables (eg, logged, polynomial, and grouped-ordinal scales) and categorical variables (eg, different cut points, categories, and reference groups) included in the models and did not alter the central findings.

With the exception of baseline age, sex, race, and ethnicity, all measures were time varying and time lagged (observed in the previous wave [ie, within the prior 24 months]) in the prospective analyses to establish temporal order when estimating the associations between the covariates and subsequent AMI.35,36 Alternative lag times (eg, no lag, 12 months, 48 months, etc.) also were assessed and produced largely consistent results.

OUTCOME

The age-specific incidence of AMI was the main outcome for analysis. At each survey interview, study participants were asked whether they had “a heart attack or myocardial infarction” and in what year

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(and month after 1994) it occurred. Age of the event was calculated from the respondents’ dates of birth and the event. Although subjects’ reports of AMI are less precise than clinical data, studies have shown general consistency between diagnostic reports of AMI from survey respondents and those from medical evaluations.37-40 The AMI outcome is analyzed as the time-to-event when either an AMI occurred or when the observation period ended for the cohort (ie, censored). Four hundred sixty-two subjects (2.9%) died during the study and were censored at their age of death. Of the 1211 AMIs, 29 (2.4%) were reported at ages that were difficult to distinguish temporarily from the time of divorce. However, by design, the time-varying measures of marital status and divorce were time lagged to ignore divorces that were reported concurrently with AMI for these 29 subjects.35-36

Statistical Analysis
Baseline characteristics of the HRS sample were computed for all participants and for men and women. Comparisons by sex were calculated with χ² tests for continuous and count variables and χ² tests for categorical variables. P values were based on 2-tailed tests and considered statistically significant at P<0.05. Although only a small number of deaths occurred during the study period, competing-risk hazard models were estimated to account for potential bias because of selective mortality.41 This method was also effective for using the rich time-varying data and for taking into account the temporal order of exposure to divorce and AMI events.35-40 Results from Cox proportional hazard models were nearly identical to those presented here, with only negligible changes in the point estimates and confidence intervals (CIs: ±0.01–0.001). Age-adjusted cumulative incidence rates were plotted to describe differences in age-specific rates of AMI for men and women by marital status and cumulative number of divorces. Multivariable competing-risk models were then used to estimate the adjusted hazard ratios (HRs) and 95% CIs of AMI associated with marital status and the cumulative number of divorces. The number of tied events relative to the number at risk was low (<1%), and partial likelihood estimation was nearly identical using Breslow (reported herein) and Efron approximations in preliminary analyses.

The first set of multivariable models examined AMI risks associated with marital status and the cumulative number of divorces by sex and adjusted for age, study cohort, race/ethnicity, and geographic region. The second set of multivariable analyses included additional sets of covariates to examine the potential factors contributing to AMI risks in men and women. Model 1 adjusted for sociodemographic background and physiological status. Subsequent models included Model 1 adjustments with additional covariates for socioeconomic factors (Model 2), psychosocial factors (Model 3), behavioral factors (Model 4), and all covariates (Model 5). Akaike information criterion values were used to compare log-likelihood functions to assess model fit across the non-nested models.42 Analyses were conducted using Stata 12.0 (StataCorp, College Station, TX).

Results
Baseline characteristics of the study participants are presented in Table 1. Women in the study were younger on average and more likely to be non-Hispanic black than men. Women were also less likely to be employed, have health insurance, had lower levels of education and income, exercised less, lived alone, and had more depressive symptoms than men. Rates of smoking, excess alcohol consumption, unhealthy body mass index, diagnoses of hypertension or diabetes mellitus, and the occurrence of AMI were significantly higher in men than women. Men were more likely to have worked in professional or managerial positions and less likely to have children than women. Men were also more likely to be continuously married or remarried at baseline; whereas women were more likely to be divorced or widowed. The cumulative number of divorces was not significantly different for men and women (P=0.212) at baseline. Men and women with multiple divorces were significantly more likely to be low educated, uninsured, and in lower-level occupations; and have higher rates of depressive symptoms, smoking, excessive drinking, and diagnosed hypertension than those who were continuously married (results not shown). For the total 200531 person-years of observation, 106303 were spent married, 30273 were divorced, 18697 were widowed, and 45258 were remarried.

Cumulative incidence plots shown in Figure 1 demonstrate significant differences in age-specific rates of AMI between those with a history of divorce and those continuously married for men and women (with the exception of men with 1 previous divorce). Figure 2 illustrates the sociodemographically adjusted HRs for marital status and the cumulative number of divorces related to AMI. Results showed that divorced men and women had significantly higher risks of AMI than their continuously married counterparts. Remarried women also had increased risks for AMI compared with continuously married women. One lifetime divorce was significantly associated with AMI in women but not in men and a history of ≥2 divorces was significantly associated with incident AMI in both sexes after accounting for differences in age, study cohort, race, ethnicity, and geographic region.

Table 2 reports the covariate-adjusted HRs for the marital variables in men and women controlling for sociodemographic background and physiological status. Results for Model 1 showed that AMI risks were significantly higher in women who were divorced (HR, 1.52; 95% CI, 1.20–1.93), remarried (HR, 1.39; 95% CI, 1.10–1.76), and among women with a history of 1 and multiple divorces (HR, 1.29; 95% CI, 1.05–1.60 and HR, 2.04; 95% CI, 1.53–2.73, respectively) compared with continuously-married women. The relative risks for AMI were significantly higher only in men who were currently divorced (HR, 1.26; 95% CI, 1.01–1.58) or had multiple divorces (HR, 1.38; 95% CI, 1.09–1.76). Models 2, 3, and 4 showed that additional adjustments for socioeconomic, psychosocial, and behavioral factors only partially reduced the associations between divorce and AMI. For men, we found that socioeconomic factors (namely employment status and occupational status) in Model 2
were attributable to the largest reduction in risks related to divorce. Estimated Akaike information criteria values indicated that each category of covariates had comparable levels of explanatory power. For women, we found that psychosocial factors (namely depressive symptoms) in Model 3 had the largest reduction in risks related to divorce—which were also reflected in the Akaike information criteria values. The fully adjusted results (Model 5) showed that risks for AMI remained elevated in men (HR, 1.30; 95% CI, 1.02–1.66) and women (HR, 1.77; 95% CI, 1.30–2.41) with ≥2 lifetime divorces compared with continuously married men and women. Risks for AMI were also significantly higher in women who were currently divorced (HR, 1.36; 95% CI, 1.04–1.78) and remarried (HR, 1.35; 95% CI, 1.07–1.70) compared with women who were stably married. Men who were divorced and remarried had no significant risk for AMI.

### Table 1. Characteristics of Study Participants From the Health and Retirement Study at Baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total (n=15827)</th>
<th>Men (n=7264)</th>
<th>Women (n=8563)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic background</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>54.3 (4.08)</td>
<td>55.1 (3.96)</td>
<td>53.5 (4.04)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Study cohort, 1942–1947</td>
<td>2242 (14.2)</td>
<td>1087 (15.0)</td>
<td>1155 (13.5)</td>
<td>0.008</td>
</tr>
<tr>
<td>Study cohort, 1948–1953</td>
<td>2881 (18.2)</td>
<td>1348 (18.6)</td>
<td>1533 (17.9)</td>
<td>0.288</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1541 (9.74)</td>
<td>693 (9.54)</td>
<td>848 (9.90)</td>
<td>0.443</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>2424 (15.3)</td>
<td>1005 (13.8)</td>
<td>1419 (16.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Non-Hispanic other race</td>
<td>397 (2.51)</td>
<td>183 (2.52)</td>
<td>214 (2.50)</td>
<td>0.936</td>
</tr>
<tr>
<td>Lives in the South</td>
<td>6406 (40.5)</td>
<td>2918 (40.2)</td>
<td>3488 (40.7)</td>
<td>0.472</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuously married</td>
<td>8908 (56.3)</td>
<td>4278 (56.0)</td>
<td>4630 (54.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Remarried</td>
<td>3624 (22.9)</td>
<td>1903 (26.2)</td>
<td>1721 (20.1)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>2571 (16.2)</td>
<td>989 (13.6)</td>
<td>1582 (18.5)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>724 (4.57)</td>
<td>94 (1.29)</td>
<td>630 (7.36)</td>
<td></td>
</tr>
<tr>
<td><strong>Cumulative no. of divorces</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Divorce</td>
<td>10331 (65.3)</td>
<td>4718 (65.0)</td>
<td>5613 (65.6)</td>
<td>0.212</td>
</tr>
<tr>
<td>1 Divorce</td>
<td>4181 (26.4)</td>
<td>1912 (26.3)</td>
<td>2269 (26.5)</td>
<td></td>
</tr>
<tr>
<td>≥2 Divorces</td>
<td>1315 (8.31)</td>
<td>634 (8.73)</td>
<td>681 (7.95)</td>
<td></td>
</tr>
<tr>
<td><strong>Socioeconomic factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of education, mean (SD)</td>
<td>12.5 (3.12)</td>
<td>12.6 (3.31)</td>
<td>12.4 (2.95)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lifetime occupation, professional, or managerial</td>
<td>4339 (27.4)</td>
<td>2165 (29.8)</td>
<td>2174 (25.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Not employed</td>
<td>4462 (28.2)</td>
<td>1523 (21.0)</td>
<td>2939 (34.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total income in thousands of dollars, mean (SD)</td>
<td>24.6 (41.8)</td>
<td>34.6 (55.2)</td>
<td>16.2 (22.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No health insurance</td>
<td>2512 (15.9)</td>
<td>1039 (14.3)</td>
<td>1473 (17.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lives alone</td>
<td>1411 (8.92)</td>
<td>540 (7.43)</td>
<td>871 (10.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No children</td>
<td>821 (5.19)</td>
<td>448 (6.17)</td>
<td>373 (4.36)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CES-D depressive symptoms, mean (SD)</td>
<td>1.89 (1.99)</td>
<td>1.60 (1.84)</td>
<td>2.13 (2.07)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Behavioral factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>4066 (25.7)</td>
<td>2015 (27.7)</td>
<td>2051 (24.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No alcohol consumption</td>
<td>5939 (37.5)</td>
<td>2174 (30.0)</td>
<td>3765 (44.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Excess alcohol consumption</td>
<td>1959 (12.4)</td>
<td>963 (13.3)</td>
<td>996 (11.6)</td>
<td>0.002</td>
</tr>
<tr>
<td>No vigorous exercise</td>
<td>11697 (73.9)</td>
<td>5249 (72.3)</td>
<td>6448 (75.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Physiological status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight, BMI &lt;18.5</td>
<td>199 (1.26)</td>
<td>35 (0.48)</td>
<td>164 (1.91)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Normal weight, BMI 18.5–24.9</td>
<td>5113 (32.3)</td>
<td>1918 (26.4)</td>
<td>3195 (37.3)</td>
<td></td>
</tr>
<tr>
<td>Overweight, BMI 25.0–29.9</td>
<td>6493 (41.0)</td>
<td>3591 (49.4)</td>
<td>2902 (33.9)</td>
<td></td>
</tr>
<tr>
<td>Obese, BMI ≥30.0</td>
<td>2720 (17.2)</td>
<td>1279 (17.6)</td>
<td>1441 (16.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>5062 (32.0)</td>
<td>2419 (33.3)</td>
<td>2643 (30.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1444 (9.12)</td>
<td>708 (9.75)</td>
<td>736 (8.60)</td>
<td>0.012</td>
</tr>
<tr>
<td>AMI during study period</td>
<td>1211 (7.65)</td>
<td>762 (10.5)</td>
<td>449 (5.24)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

AMI indicates acute myocardial infarction; BMI, body mass index; and CES-D, Center for Epidemiologic Studies Depression scale. P values are calculated by ANOVA or χ² tests.
Overall, the relative risks associated with multiple divorces in women were comparable with other major risk factors in the estimated models, such as smoking (HR, 1.53; 95% CI, 1.21–1.93), hypertension (HR, 1.73; 95% CI, 1.38–2.17), and diabetes mellitus (HR, 1.81; 1.44–2.28). Although the magnitudes of the HRs for divorce history were larger among women than men, the interaction terms for sex were not statistically significant. However, results showed that depressive symptoms had a significantly greater effect among women than among men ($P=0.008$) and that occupational status had a significantly greater effect among men than among women ($P=0.013$).

**Figure 1.** Age-adjusted cumulative incidence of acute myocardial infarction by marital status and cumulative number of divorces in US men and women. Note: Marital groups are significantly different from continuously married (reference) at $P<0.05$ with the exception of men with 1 divorce.

Discussion

Our study is the first to examine the association between lifetime exposure to divorce and risks for AMI in a contemporary cohort of US older adults. Results demonstrated that cumulative exposure to divorce increased risks of AMI in men and women and that the associations were not accounted for by socioeconomic, psychosocial, behavioral, or physiological factors. Women with multiple divorces were at especially high risk of AMI. We also found that remarried women had risks that were similar in magnitude to divorced women; whereas men who remarried had no significant risk for AMI.

Previous studies have documented cross-sectional associations between marital status and multiple health outcomes. The current study is the first to demonstrate the longitudinal association between divorce and AMI and extends our understanding of lifetime exposure to social stressors and cardiovascular risks. The results of this study contribute to mounting evidence that AMI risks associated with social stressors are of the relative magnitude of established risk factors such as smoking, diabetes mellitus, and hypertension. In women, for example, we found that the multivariable-adjusted risks associated with hypertension (HR=1.73) and diabetes mellitus (HR=1.81)
were comparable with the risks observed in women with a history of ≥2 divorces (HR=1.77). The risks attributable to divorce are also analogous to the association recently documented between lifetime exposure to job loss(es) and AMI. The risks associated with divorce largely mirror these protracted and cumulative associations in acquired risk related to unemployment.

Two additional findings are notable. First, this study showed that remarried women had risks for AMI that were nearly equivalent in magnitude to divorced women (HRs=1.35 versus 1.36, respectively) compared with continuously married women. This pattern has been observed in related research. For example, studies have shown that remarried women have greater levels of physical and psychological illness than women who were continuously married; whereas remarried men did not differ in health outcomes compared with continuously married men. Therefore, our findings corroborate existing evidence to suggest that remarriage after divorce may not confer the same health benefits for women as for men. Second, we examined whether the association between divorce and AMI has strengthened or weakened over time as the prevalence of and attitudes toward divorce have changed in American society. Supplementary analyses of interactions between successive birth cohorts and the marital covariates indicated that there were no significant changes in the associations during this study period.

An important area for future research will be to investigate the mechanisms underlying these findings and to identify possible interventions to reduce these risks. The prevailing argument is that divorce has a negative impact on the economic, behavioral, and emotional well-being of individuals that reduces their ability to prevent, detect, and treat illness. Contrary to expectations and existing literature, we found that losses of income and health insurance, and increases in depressive symptoms, alcohol use, and smoking did not account for the excess risks attributable to a history of divorce in men and women. We suspect that the acute and chronic stress associated with divorce may have played an important role in our findings for both sexes. Studies have recently identified possible biological mechanisms (eg, blood pressure reactivity, elevated cortisol, and hemoglobin A1c) related to the stress of divorce that warrant additional investigation as they relate to increased risk for AMI. Relatedly, we also suspect that a history of divorce may have had negative consequences for medication...
adherence, healthcare utilization, and disease management that may have precipitated or worsened vascular pathology.\textsuperscript{15,18,49,50} Accordingly, studies have shown that spouses (particularly wives) encourage concordant health behaviors—such as proper diet, exercise, and medication compliance—that promote cardiovascular health.\textsuperscript{30–32} Therefore, we encourage future studies to explore these mechanisms to help explain how repeated exposure to divorce incurs increasing risks for AMI.

Major strengths of this study included panel data from a large, representative sample of middle-aged and older US adults, the use of retrospective histories and prospective data spanning almost 20 years, and multivariable competing-risk hazard models that used time-varying covariates to estimate incidence of AMI. The HRS provide the only known source of data that includes measures of AMI along with rich time-varying measures of marital life and numerous socioeconomic, psychosocial, behavioral, and physiological covariates. Our study demonstrated significant associations between divorce history and AMI after adjusting for the confounding effects of numerous cardiovascular risk factors. The time-varying covariates also captured changes in many of the socioeconomic, psychosocial, and behavioral factors thought to account for the elevated risks after a divorce.

Despite the strengths of this study, we acknowledge several limitations. Although the data were rich in the number and scope of measured covariates, we lacked certain clinical parameters. First, we acknowledge that the analyses of AMI are based on self-reported data and not medical evaluations. However, studies generally have shown consistency between diagnostic reports of AMI from survey respondents and those from medical evaluations—with self-reported AMI having a high degree of sensitivity (90% to 98%), specificity (98% to 99%), and overall agreement (94% to 98%) with medical data.\textsuperscript{37–40} Nevertheless, we acknowledge that self-reported AMI is less accurate than medical reports and future studies are warranted to validate these findings with medical assessments. Another limitation is the possibility that additional unmeasured factors may have contributed to the associations. For example, data were not available for the treatment and control of hypertension, diabetes mellitus, and hyperlipidemia before AMI, or other prothrombotic measures to reduce the likelihood of infarction (eg, prior revascularization). We also could not identify the characteristics or quality of past marriages or the circumstances of divorce. Although detailed measures of past marital relationships were not available, the multivariable analyses showed that depressive symptoms and maladaptive behaviors did not account for the findings. Relatedly, we lacked direct measures of stress, anxiety, and the loss of social support that may have contributed to the association between divorce and subsequent AMI.

The results from this study provide new and actionable knowledge that have the potential to assist in clinical decision-making and improve quality of care. Although marital events are not amenable to medical intervention, knowledge about the risks associated with divorce will be useful for personalizing care and preventing new or recurrent AMI. For example, we found that divorced women—particularly those who experienced multiple divorces—may benefit from additional screening and treatment for depression or other symptoms of distress. Likewise, men who have been divorced more than once—particularly men in lower-level occupations—may benefit from consultation for smoking, alcohol use, or other maladaptive behaviors that accompany the stress of marital loss. New insights such as these will help providers identify and treat adults at potentially high risk of AMI, as well as provide patients a new (or heightened) awareness of their social risks that go beyond the cautionary litany of poor diet, inactivity, and smoking.

In summary, results from our large prospective cohort study demonstrated an association between one’s lifetime exposure to divorce and risks for a major cardiovascular event. The relative risks attributable to divorce were comparable in magnitude with other traditional risk factors and accumulated with increasing exposure to divorce, particularly in women. Future studies are needed to further examine the mechanisms contributing to these associations and to assess how such information can be used to target and aggressively treat vulnerable segments of the population.

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