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"AND THEY ALL LIVED HAPPILY EVER AFTER"? MARITAL QUALITY, MARITAL DISSOLUTION, AND MORTALITY*

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“AND THEY ALL LIVED HAPPILY EVER AFTER”? MARITAL QUALITY, MARITAL DISSOLUTION, AND MORTALITY

ABSTRACT We examine the relationships between marital quality, marital dissolution, and mortality outcomes among older adults over a sixteen-year period using discrete time event history models with data from nine waves (1992-2008) of the Health and Retirement Study (n=7,388). Results show that quality of marital interaction is negatively related to mortality for women and perceiving low power in the relationship is positively related to mortality for men. The influence of marital quality on mortality is mediated by health and, for men, by health behaviors. Being widowed more than two years significantly raises the hazard of mortality, as does being divorced more than two years for men. For women, the higher mortality hazard following widowhood is due to declines in socioeconomic status; however, the increased risk of mortality for men remains significant even after controlling for sociodemographic factors, economics, health, and health behavior.

"AND THEY ALL LIVED HAPPILY EVER AFTER"?

MARITAL QUALITY, MARITAL DISSOLUTION, AND MORTALITY

Married individuals have lower mortality rates than do the unmarried, a finding which is robust across diverse samples from a number of different countries (e.g., Brockman and Klein 2004; Dupre, Beck, and Meadows 2009; Johnson et al. 2000; Manzoli et al. 2007; Nilsson et al. 2005). It is less clear if all married adults benefit equally from marriage, given that the vast majority of existing studies compare the married with other unmarried groups. Despite calls for more research attention to the influence of marital dynamics on longevity (Krueger 2009; Manzoli et al. 2007), very few studies have examined variations in mortality outcomes *among* those who are married, and those that do generally use small or non-representative samples (Coyne et al. 2001; Murberg 2004; Rohrbaugh, Shoham, and Coyne 2006). Although these studies suggest a relationship between marital quality and mortality, they also suggest the effect may differ for men and women and that only certain dimensions of marital dynamics may influence longevity (e.g., Birditt and Antonucci 2008; Tower et al., 2002).

Using a nationally representative sample (n = 7,388) from nine waves (1992 – 2008) of the Health and Retirement Study (HRS), this study has three main aims: (1) to assess whether marital quality influences subsequent mortality risk for a group of older individuals, explicitly exploring whether this relationship may be different for men and women; (2) to examine whether the consequences of marital dissolution for mortality may depend on the quality of the relationship (that is, for those in unhappy relationships, might the end of the marriage have little effect on mortality risk or even reduce it?), and (3) to investigate potential mechanisms whereby marital quality and marital dissolution might influence mortality using time-varying measures of socioeconomic status, physical health, and health behaviors.

BACKGROUND

(How) Is Marital Quality related to Mortality among Older Men and Women?

Although hundreds of studies find that married individuals have a longevity advantage over the unmarried, only a handful have investigated marital dynamics (Birditt and Antonucci 2008; Brown et al. 2003; Coyne et al. 2001; Eaker et al. 2007; Hibbard and Pope 1993; Murberg 2004; Murberg and Bru 2001; Rohrbaugh et al. 2006; Tower, Kasl, and Darefsky 2002). Some find that marital quality is negatively related to mortality risk (Brown et al. 2003; Coyne et al. 2001; Hibbard and Pope 1993; Rohrbaugh et al. 2006; Tower et al. 2002), although variations in measurement of marital quality between studies – as well as variations in samples – yield some contradictory results. Among patients diagnosed with heart failure, marital quality is strongly related to mortality even after controlling for severity of heart condition and other indicators of health (Coyne et al. 2001; Rohrbaugh et al. 2006). Perceiving consistently low levels of listening by one's spouse and experiencing an increase in criticism from a spouse raises mortality risk (Birditt and Antonucci 2008), whereas providing emotional support to one's spouse lowers one's mortality risk (Brown et al. 2003).

However, the relationship between marital quality and mortality may be different for men and women. Bernard (1972) suggests such pervasive gender differences in the marital experience that there are actually two marriages: "his marriage" and "her marriage." While married men experience greater marital satisfaction, improved mental health, lower mortality rates, and more power in the relationship, married women experience declines in mental health and happiness and losses in autonomy and power (Bernard 1972; Eaker et al. 2007; Komter 1989; Umberson et al. 2005; Zipp, Prohaska, and Bemiller 2004). The greater health benefits of marriage evidenced by men may stem from the increased social integration, improved health behaviors, and greater emotional support men receive vis-à-vis their wives; women, on the other hand, tend to maintain their own social ties, familial relationships, and health behaviors even when not married (Bernard 1972; Lilliard and Waite 1995). Rather than marriage improving women's social integration and health behavior, it may translate into increased stress as women assume a disproportionate share of household labor and childcare and attempt to balance paid work and family life (Bernard 1972; Hochschild 1989).

In fact, the small body of existing literature on marital quality and mortality shows some gender differences in the relationship. Tower et al. (2002) find marital closeness is more closely linked to mortality for men, though two other studies find that marital satisfaction, companionship, disagreements, and equality in decision-making are not significantly related to men's mortality risk (Eaker et al. 2007; Hibbard and Pope 1993). Instead, some studies suggest marital quality may have a stronger relationship with mortality for women. Keeping conflict to oneself increases women's mortality risk four-fold (Eaker et al. 2007), and marital companionship and equality in decision-making are negatively related to mortality for women but not for men (Hibbard and Pope 1993). Although marital quality is related to four-year mortality for both men and women previously diagnosed with heart failure, the relationship is stronger for women; and, when examining eight-year mortality, there is a significant effect of marital quality on mortality only among women (Coyne et al. 2001; Rohrbaugh et al. 2006).

Although some dimensions of marital quality appear to affect mortality, other dimensions do not. The global, subjective marital satisfaction measure most often used by researchers seems to perform particularly poorly; several studies find no significant relationship between marital satisfaction and mortality (Brown et al. 2003; Eaker et al. 2007; Hibbard and Pope 1993). Further, studies show no significant effects of receiving support from a spouse (Brown et al.

2003; Murberg 2004; Murberg and Bru 2001), disagreements (Eaker et al. 2007), dependence on spouse (Brown et al. 2003), or equity in the relationship (Brown et al. 2003; but see Hibbard and Pope 1993).

Part of the reason for such disparate findings may be due to the small, non-representative samples used in many of these studies. Two use a sample of 119 respondents diagnosed with congestive heart failure (Murberg 2004; Murberg and Bru 2001), and two others include 189 couples in which one spouse has been diagnosed with heart failure (Coyne et al. 2001; Rohrbaugh et al. 2006). Hibbard and Pope (1993) use a sample of individuals in Oregon and Washington who were subscribers to a Kaiser Permanente health plan, with baseline interviews in 1970-1971. Even studies using representative samples, such as the Yale Health and Aging Project (YHAP) and the Changing Lives of Older Couples (CLOC), typically have modest sample sizes (305 and 423 couples, respectively), and the relatively small number of subsequent deaths may limit statistical power to detect gender differences and to examine interactions between marital quality and marital dissolution (Brown et al. 2003; Tower et al. 2002). And while two other studies use larger, representative samples (1,466 and 2,993 married individuals, respectively), they also do not examine how marital quality may play a role in the effects of union dissolution on mortality, nor do they test the potential mediating effects of health behaviors (Birditt and Antonucci, 2008; Eaker et al. 2007).

In this study, we build on these previous studies by utilizing prospective, nationally representative data from the Health and Retirement Study (n=7,388) with a much larger sample size, a focus specifically on gender differences among older men and women, a prospective investigation of both marital quality and marital dissolution, and the ability to examine three measures of marital quality: marital satisfaction, quality of marital interaction, and power.

Respondents are re-interviewed every two years, allowing for an examination of time-varying mediating factors such as socioeconomic status and health. This enables us to examine pathways through which marital quality may influence mortality; unlike the majority of existing studies, which examine these factors only at baseline, HRS respondents are re-interviewed eight times after their initial baseline interview. In addition, for those who divorce or become widowed over the course of the study, we are able to examine how marital quality prior to marital dissolution may affect mortality risk.

Theoretical Perspective

The stress and coping perspective suggests that stress – and particularly chronic, long-term stress – has negative implications for health (Lazarus 2000). Yet the relationship between stress and health is not monolithic; coping resources and social support can moderate the relationship, buffering the negative effects of stress on health. While studies of adolescence and young adulthood show that such protective support usually comes from a close relative, as the life course unfolds the primary source of social support transitions to peers and ultimately to a significant other, most often a marital partner (see Meadows et al. 2006). Regardless of the source of social support, evidence has shown that such relationships buffer the negative consequences of stress (Umberson and Montez 2010), with particularly strong evidence showing a reduction in the risk of stress-induced mental health problems (e.g., Brown et al. 2007; Meadows et al. 2006; George and Lynch 2003).

"Marriage benefits" in terms of health and longevity may be attributable to a spouse acting as a readily available, long-term, and intimate form of social support. This support may protect individuals from stress they experience in their lives by buffering the negative effects of stress. However, not all individuals' marital relationships are characterized by intensive support.

In an unhappy marriage, a spouse may not be acting as a form of social support, representing the absence of a pathway through which marriage may confer benefits. Additionally, an unhappy marriage may also act as a source of chronic stress, to the detriment of health. Thus, when comparing high- and low-quality marriages, those in low quality marriages may have a mortality disadvantage for two important reasons: the absence of an important form of social support and the presence of a significant form of chronic strain.

There is some evidence that the association between marital quality and health is stronger for older adults than for those who are younger (Umberson et al. 2006), suggesting that marital quality may be particularly important to health in later life. This may be due in part to age itself; health tends to become more fragile with age, perhaps making an individual more vulnerable to the consequences of a stressful marriage. In addition, as the effects of marital stress accumulate on health and health behavior over the life course, the most pronounced variations may be evident in later life (Umberson, Crosnoe, & Reczek 2010; Umberson & Montez 2010). However, it may also be that for older cohorts, marriage was considered more normative, with greater social sanctions for ending a marriage via divorce. The consequences of an unhappy marriage may be particularly detrimental for this group, be it through inability to attain the normative ideal of a happy marriage or feeling unable to leave the marriage. Additionally, gender differences in the effects of stress and the mediating effect of support have been noted (e.g., Meadows et al. 2006; Umberson and Montez 2010), with women being more susceptible to effects of relationship stressors (Hankin and Abramson 2001; Heaton and Blake 1999; Joyner and Udry 2000; Marcotte et al. 1999; Simmons et al. 1987). This may especially be the case for older women, as women in older cohorts were considered the caretakers of the "home and hearth," therefore perhaps internalizing more

responsibility for unsatisfactory marital relationships.

Does the Effect of Marital Dissolution on Mortality Depend on Marital Quality?

A number of studies find that individuals who are divorced or widowed have a heightened mortality risk when compared to the married (e.g., Hemström 1996; Manzoli et al. 2007; Tucker et al., 1996). This is consistent with the stress and coping perspective; marital dissolution (whether through divorce or widowhood) may represent a major source of stress as well as the loss of an important source of social support. However, for those in low-quality marriages, marital dissolution may signify something different: namely, the end of a chronic source of stress. Additionally, in an unhappy marriage one's spouse may not have been acting as a source of emotional support, meaning that social support may not be lost over the transition to divorce or widowhood.

Some existing research suggests that the negative consequences of widowhood for older adults' psychological well-being are moderated by marital quality (Carr 2000), but it is not clear whether a similar effect is evident for longevity. To our knowledge, none of the existing studies of marital quality and mortality have used prospective, longitudinal data to test whether the effects of marital dissolution on mortality might depend on marital quality. Divorce that takes place during the later life course is non-normative, particularly for older cohorts, which may make it particularly stressful. This may especially be the case for older women, given that it is less typical for women of these cohorts to have held life-long careers, have non-interrupted work histories, or have had control of the family's finances, all of which could make divorce more economically stressful. It is possible that the end of a high-quality marriage is associated with a higher risk of mortality, whereas the dissolution of a low-quality marriage is associated with a lower risk of mortality or unassociated with mortality risk at all. Yet while ending an unhappy marriage via divorce may not represent the loss of a supportive partner, it may mean the loss of other forms of support such as financial resources, place of residence, or access to health care, losses that are often greater for women than for men (e.g., Amato 2000).

Mechanisms through which Marital Quality may affect Mortality

Umberson and Montez (2010) outline three sets of mechanisms through which relationships may affect health: psychosocial, physiological, and behavioral. Psychosocial pathways include the increased social support, discussed earlier, that may characterize marriages marked by high self-rated quality. The second, physiological mechanisms, suggest that marital quality may impact mortality is through changes in an individual's physical health. Biosocial research increasingly confirms that negative emotions and conflict with a marital partner affect health directly via alterations in the immune, endocrine, cardiovascular, and central nervous systems (see Kiecolt-Glaser et al. 2002 for an extensive review). The multiple biological pathways linking emotions and health suggest that the impact of marital quality on health may be pervasive across a number of health conditions, in turn contributing to higher mortality (Kiecolt-Glaser et al. 2002). Indeed, numerous studies find that marital quality is associated with health, with those in unhappy marriages not reaping the same benefits as the happily married (Bookwala 2005; Wickrama et al. 1997; Ren 1997).

The third pathway through which marital quality may influence mortality – less directly than marital stress causing physiological changes that lead to poorer health – is through health behaviors. A spouse may encourage positive behaviors such as regular doctor visits and maintaining a healthy weight, and discourage risky behaviors such as smoking or excessive drinking (Umberson et al. 2010; Waite and Gallager 2000). However, as Krueger (2009) points out in a recent review of marital status and mortality, research has not adequately assessed the degree to or circumstances in which spouses do or do not support healthy behaviors. Consistent with Preston and Taubman's (1994) contention that health behaviors may depend on one's projected levels of satisfaction in life, the extent to which marriage encourages healthy behaviors may depend on the quality of the relationship. Based on these studies, we examine the potential mediating role of multiple measures of health and health behaviors in our analyses.

Other Factors Related to Marital Quality and Mortality

Several other factors are important to account for when examining the relationship between marital quality and mortality. Tower et al. (2002) find a very strong moderating effect of having children on the relationship between marital closeness and mortality (but see Hibbard and Pope 1993). Economic strain may also be a chronic form of stress affecting health, as socioeconomic status is negatively related to health and longevity (Smith and Waitzman 1994). In addition, sociodemographic factors may also play a role. African Americans have higher mortality rates than do Whites (Johnson et al. 2000), and age is positively related to mortality risk (Tower et al. 2002). Marital history appears to moderate the relationship between marital status and mortality outcomes. Marital duration is especially important, with mortality advantages accruing over the length of a marriage (Dupre et al. 2009). Further, as compared to first marriages, remarriages may not confer the same mortality advantages, particularly when the remarriage follows a previous divorce (Hemström 1996). This is consistent with studies showing a long-term effect of marital dissolution whereby remarried individuals have poorer health than those in first marriages (Hughes and Waite 2009), a disparity which may increase over time for women (LaPierre 2009). METHOD

Data

We use data from nine waves (1992-2008) of the Health and Retirement Study (HRS). The HRS is sponsored by the National Institute on Aging and is conducted by the University of Michigan. This nationally-representative, longitudinal study of adults over the age of 50 includes oversamples of Blacks and Latinos and re-interviews respondents every two years. The first wave of data collection in 1992 includes interviews with 12,521 respondents. We exclude those who are not married (n=2,750), those under age 50 (n=1,698), those missing data on any one of the marital quality questions (n=517), and those who are not followed up in at least one subsequent wave (n=168), for a final sample of 7,388 individuals[1]. *Measures*

The dependent variable, *mortality*, represents mortality from any cause. Date of death is determined by HRS-linked National Death Index (NDI) records or a report from a surviving spouse or family member interviewed by the HRS after the main respondent's death. Of the 7,388 respondents in the analytic sample, 1,620 (21.9%) die over the sixteen-year period from 1992 to 2008.

Previous research finds that marital quality is a multi-dimensional concept (Johnson et al. 1986). Therefore, three separate measures of marital quality are used in the analysis, all of which are measured at baseline in 1992. *Marital satisfaction* is the response to a single, global item asking the respondent, "Are you very satisfied, somewhat satisfied, about evenly satisfied and dissatisfied, somewhat dissatisfied, or very dissatisfied with your marriage?" This item ranges from (1) very dissatisfied to (5) very satisfied. Because this variable is highly skewed, with 84% of respondents choosing the highest category and less than three percent choosing the lowest three categories, the variable is dichotomized. Those who report "very satisfied" (5) are coded (1) and all others are coded (0). This dichotomization of very happy versus all others has been used by other scholars when analyzing a highly-skewed global marital satisfaction measure (e.g., Kaufman & Taniguchi, 2006). In supplemental sensitivity analyses (results available upon request from authors), we tested other transformations of this variable, and results were similar regardless of coding strategy. *Enjoyment of interaction* indicates quality of interaction with one's spouse. It is the response to a single item asking respondents, "Generally speaking, would you say the time you spend with your [spouse] is extremely enjoyable, very

enjoyable, somewhat enjoyable, or not too enjoyable. The scale ranges from (1) not too enjoyable to (4) extremely enjoyable. *Low marital power* combines responses from two HRS questions asking about spousal power in decision making. The first asks whether the respondent or spouse has more say in major family decisions, and the second asks the degree to which the respondent or spouse has more say. Responses are used to create one variable ranging from (1) respondent has a lot more say than spouse, (2) respondent has a little more say, (3) equal say, (4) spouse has a little more say, to (5) spouse has a lot more say than respondent.

We examine the potential mediating role of health, health behaviors, and health care utilization in the relationship between marital quality and mortality. *Subjective health* is the respondent's rating of their overall health and ranges from (1) poor to (5) excellent. *Activities of daily living (ADL)* is a count of the number of limitations the respondent has with toileting, eating, dressing, bathing, or walking across the room. *Currently smoke* is a dichotomous variable coded (1) if the respondent currently smokes and (0) otherwise. *Body mass index (BMI)* represents the respondent's BMI, calculated using the respondent's self-reports of height and weight. Less than one percent of the sample has an extreme value of BMI; for these cases, we top-code BMI to 66, which represents the ninety-ninth percentile. *Problematic drinking* is coded (1) if the respondent reports consuming three or more drinks per day on the days that they drink and (0) otherwise. *Doctor visit* is a dichotomous variable indicating whether the respondent has visited a physician. In the 1992 wave, respondents are asked whether they have visited a doctor in the previous year; in all subsequent waves, they are asked whether a doctor visit has occurred since the previous interview (approximately two years).

Socioeconomic variables may also mediate the relationship between union dissolution and mortality. *Education* is measured as the number of years of completed education. *Household income* and *net worth* measure the respondent's total household income and wealth (assets minus debts), respectively, in dollars; both are logged for use in multivariate analysis. *Health insurance* is a dichotomous variable coded (1) if the respondent is currently covered by any health insurance.

Finally, we control for sociodemographic and union characteristics related to marital quality and mortality. *Female* is a dichotomous variable coded (1) if the respondent is female and (0) otherwise. *Age* is the respondent's age in number of years. Four mutually-exclusive dichotomous variables are used to indicate the respondent's race-ethnicity: *Non-Latino White* (used as the reference group in multivariate analyses), *non-Latino Black, Latino,* and *other race-ethnicity*. *Children* is a count of the number of the respondent's children currently in contact. *Remarriage* is a dichotomous variable coded (1) if the respondent is in a higher-order marriage and (0) otherwise. *Marital duration* indicates the duration of the current marriage in years[2]. *Plan of Analysis*

The HRS employs sophisticated bracketing techniques to minimize non-response to income and asset measures, and then uses hot-deck imputation techniques to impute within brackets. We utilize these imputed measures of income and wealth available in the HRS. Less than four percent of respondents are missing data for any of the other independent variables. For those with missing data at baseline, we use the "impute" command in Stata, which utilizes multiple regression to predict the value of missing responses based on the pattern of other independent variables (StataCorp 2007). For those with missing data in subsequent waves, we use the value of the variable from the respondent's most recent previous interview.

We first examine descriptive statistics for the dependent and all independent variables at baseline. Then, we use discrete-time event history analysis to examine the mortality hazard net of marital quality, marital dissolution, and the other independent variables. Specifically, we employ discrete-time logistic regression models. The analytic model is, therefore,

$$Y_{c,j}^{*} = \alpha_{j} + \sum_{j=1}^{J} \beta_{j} X_{j,i,t} \quad (1)$$

Where Y^* is the logit transformation of $P(t)$—$log(P(t)/(1-P(t))$—where $P(t)$ represents the probability an individual dies at time t, given that a person is still alive at time t (see Allison, 1984; Yamaguchi, 1991); α is the overall intercept; and βX represents each predictor measure j for individual i at time t. In addition, given that we are modeling a mortality hazard, a linear measure of time is incorporated into all models, which results in a Gompertz hazard rather than a simple exponential hazard typical of discrete-time logistic models (Allison, 1984).

Marital quality, age, gender, race-ethnicity, union duration, remarriage, and education are all measured only at baseline in 1992. Children in contact, income, assets, health insurance, subjective health, ADL limitations, smoking, problematic drinking, BMI, and doctor visits are all time-varying variables measured at the

time of interview at each wave of data collection. Marital dissolution is also a time-varying variable that reflects both the type of union dissolution (divorce or widowhood) and length of time since it occurred (within the past two years versus more than two years).

Given that a number of studies suggest that marital quality and marital dissolution may influence health and longevity differently for men and women (e.g., Coyne et al. 2001; Rohrbaugh et al. 2006) – and that the mechanisms underlying the relationship may also differ by gender (Umberson et al., 2010) – we prefer to analyze separate multivariate models for men and women. However, splitting the sample by gender rests on the fundamental assumption that the effect of the regressors in the models differ by gender, an assumption that should be tested empirically (DeMaris, 2004). Therefore, we conduct Allison's (1999) Chow test analog for logistic regression. This test is statistically significant[3] ($p < 0.001$) suggesting that the effects of the covariates in the models are different for men and women (DeMaris, 2004). Based on both the theoretical and statistical rationales, we therefore conduct all analyses separately by gender.

The HRS uses a multi-stage, area probability sampling design, and oversamples for African Americans, Latinos, and residents of Florida (Heeringa and Connor 1995). Descriptive analyses use the individual-level weight available in the HRS to correct for oversampling and to ensure that the sample is nationally representative. However, the individual-level weight is not used in multivariate analyses as it can introduce bias (DeMaris 2004). Both descriptive and multivariate analyses utilize the HRS survey cluster weights to correct for the complex sampling design effects of the study by using the "svy" commands in Stata. RESULTS

Weighted means for all variables are shown separately for men and women in Table 1. A lower percentage of women die during the course of the study than do men. Although there are no gender differences in the percentage of marriages that dissolve via divorce, women are more likely to transition to widowhood than men. Women report lower satisfaction with their

marriage overall, lower quality of interaction with their spouse, and perceive having lower power

in their marriages, on average. This is consistent with previous research finding that women report lower marital quality and marital power than men, a disparity that extends to the later life course (Bernard 1972; Kaufman and Taniguchi 2006; Kulik 2002; Umberson et al. 2005).

[*TABLE 1 ABOUT HERE*]

The average age of respondents is between 55 and 58 years, with women in the analytic sample being younger than men, on average. Marital duration is higher among women, and the percentage of women in a higher-order marriage is lower than for men. On average, men report higher education and household income, and they are more likely to have health insurance. Although there are several gender differences in health behaviors – with a lower percentage of women displaying problematic drinking, a higher percentage having visited a doctor, and women having lower BMI – there are no significant gender differences with respect to subjective health or ADL limitations. *Marital Quality, Gender, and Mortality*

Our first aim is to examine how marital quality is related to mortality among older men and women. Model 1 of Table 2 shows the relationship between marital quality and mortality for women without controls. Only quality of interaction with spouse is significantly related to women's mortality risk. Comparing those at opposite ends of the quality of interaction measure, women who rate the time spent with their spouse as extremely enjoyable have an 80% lower hazard of mortality than women who rate the time spent with their spouse as not very enjoyable. Neither overall marital satisfaction nor perceived power in the relationship is significantly associated with mortality for women.

[*TABLE 2 ABOUT HERE*]

Model 4 of Table 2 shows that both quality of interaction with spouse and power in the relationship are significant correlates of men's mortality. Compared to men who rate the time spent with their spouse as not very enjoyable, men who report this time to be very enjoyable have a 41% lower mortality hazard. And, men who report that their wives have much more say than they do in major decisions have a 40% higher hazard of mortality than men who report that they have much more say than their wives in decision making. Similar to the results for women, though, marital satisfaction is not significantly related to mortality for men.

Thus, results indicate that there are variations in mortality risk by marital quality among the married, but that there are some gender differences in the relationship. This is consistent with previous research showing that marital quality is related to mortality (Coyne et al. 2001; Rohrbaugh et al. 2006). It is also consistent with research finding that global satisfaction with the relationship may be less important to longevity than other dimensions of marital quality (Eaker et al. 2007; Hibbard and Pope 1993). However, our findings contradict previous research finding no relationship between marital support and mortality (Murberg 2004; Murberg and Bru 2001), or a relationship only among those with a chronic condition (Birditt and Antonucci 2008). They also counter Hibbard and Pope's (1993) finding that marital equity is not significantly related to mortality for men.

Marital Dissolution

Our second aim is to examine whether marital quality moderates the relationship between union dissolution and mortality for men and women. Table 2 also shows the relationship of marital dissolution with mortality while including controls for sociodemographic factors. Model 2 shows that transitioning from marriage to divorce during later life – regardless of length of time since the divorce has taken place – is not significantly related to mortality for women.

Becoming widowed within the previous two years also is not related to mortality for women. However, compared to women who remain continuously married, a transition to widowhood that has taken place more than two years ago increases a woman's hazard of death by approximately 30 percent (when controlling for sociodemographic factors).

Model 5 of Table 2 shows that men – like women – do not have heightened mortality risk within two years after marital dissolution takes place. However, men who have divorced more than two years prior have 1.65 times the hazard of mortality and men who have been widowed more than two years prior have 1.53 times the hazard of mortality as men who remain continuously married. For both men and women, it appears the consequences of marital dissolution for mortality are longer-term (though only in terms of widowhood for women). This contradicts some previous research suggesting that the short-term effects of marital dissolution are greatest for mortality (Dupre et al. 2009; Schaefer, Quesenberry, and Wi 1995), and that transitioning to divorce is more harmful to longevity than transitioning to widowhood (Dupre et al. 2009). However, it is important to note that all of the marital transitions that take place in our sample happen during the later life course (after age 50). This suggests the importance of long-term effects of widowhood for both men and women and of divorce for men, and perhaps differing consequences of marital quality for mortality across the life course.

In addition, results in Table 2 show that, regardless of gender, remarriages are less protective of longevity than are first marriages. This is consistent with research showing that the consequences of union dissolution are long-lasting (Trovato and Lauris 1989; Tucker et al. 1996), that those in remarriages have poorer health outcomes than those in first marriages (Hughes and Waite 2009; LaPierre 2009), and that those who repartner after divorce have higher

mortality rates than those who are continuously married (Hemström, 1996).

We further assess whether the relationship between marital dissolution and mortality may be accounted for by controlling for baseline marital quality. Results in Table 2 (Models 3 and 6) show that controlling for marital quality accounts for very little or no change in the coefficients for divorce or widowhood for either men or women. The logistic regression model is naturally interactive in the regressors' effects on mortality (DeMaris, 2004). That is, the change in the odds of mortality for those who divorce versus those who do not has a different impact based on level of marital quality. However, the interactive nature of the regressors are constrained to be ordinal in the logistic model, whereas testing a multiplicative interaction term between two specific regressors within the logistic regression allows the effect to be disordinal (DeMaris, 2004). In order to test this possibility – that the *direction* (not simply the magnitude) of the impact of marital dissolution on mortality changes over the level of marital quality – we enter a cross-product term between marital quality and divorce and between marital quality and widowhood into separate models. However, there are small cell sizes when examining pre-dissolution marital quality by type and length of time since marital dissolution for men and women separately. Therefore, we estimate separate models in which divorce and widowhood (not separated by length of time since the dissolution) are interacted with each of the pre-dissolution measures of marital quality. None of these interactions are significant (results not shown). Instead, marital quality and marital dissolution appear to have largely independent effects on mortality. This supports previous findings that those who are divorced or widowed have higher mortality rates (Manzoli et al. 2007; Tucker et al. 1996) and extends them by showing that these consequences exist regardless of pre-dissolution relationship quality.

Mechanisms

Our third aim is to examine the mechanisms via which marital quality may affect mortality for men and women. Having demonstrated that both marital quality and marital dissolution are related to mortality, we turn to an examination of the pathways through which these effects may operate. Table 3 shows the discrete-time event history models for women. Model 1 includes only the marital quality and marital status variables and the sociodemographic controls. Enjoyment of time spent with one's spouse is the only marital quality variable significantly related to mortality; women who report greater enjoyment of the time they spend with their spouse have a lower hazard of mortality, on average. Satisfaction with marriage and marital power are not significantly related to mortality for women. Of the marital status transition variables, only long-term widowhood is a significant predictor of mortality. Women who have been widowed more than two years have 1.36 times the hazard of mortality compared to women who are continuously married, controlling for baseline marital quality and sociodemographic factors.

[*TABLE 3 ABOUT HERE*]

Models 2 through 4 (Table 3) add socioeconomic, health, and health behavior variables in separate blocks to examine potential mechanisms through which marital quality or marital status transitions may influence mortality risk. Enjoyment of time with spouse is significant even after controlling for socioeconomics and health behaviors (Models 2 and 4, respectively). However, after accounting for health in Model 3, the coefficient for enjoyment of time with spouse reduces to nonsignificance. It appears that enjoyment of time with spouse may affect mortality indirectly via health; those who report greater enjoyment of time with their spouse evidence greater subjective health, which in turn is related to a lower hazard of mortality. This is consistent with research showing that marital quality is positively related to subjective health (e.g., Ren 1997).

We are also able to elucidate the pathway via which becoming widowed may affect morality risk for older women. After controlling for socioeconomic status in Model 2 (Table 2), the coefficient for long-term widowhood reduces to nonsignificance for women. It appears that the higher mortality hazard evidenced by women who become widowed is due in large part to their lower socioeconomic status following widowhood. Previous studies find that women's financial well-being is particularly affected by divorce (e.g., Amato 2000), and our findings suggest this has real consequences for older women's mortality risk.

Table 4 shows the same models for men. Model 1 includes only marital quality, marital status transitions, and the sociodemographic controls. This model shows that, for men, having lower power than their wives in the relationship is linked to a greater hazard of mortality. In addition, becoming widowed or divorced is also linked to a greater hazard of mortality, so long as the marital dissolution took place more than two years prior. As was the case for women, it appears the effect of divorce or widowhood on mortality is greatest in the long term.

[*TABLE 4 ABOUT HERE*]

Subsequent models add the socioeconomic, health, and health behavior variables in separate blocks. Model 2 (Table 4) shows that the coefficient for low power reduces to nonsignificance after controlling for socioeconomic status. This may be due to socioeconomic inequalities in the relationship that produce the lack of power for men; for example, being unemployed, retiring before his wife, or earning less than his wife may mean a husband has less say in making major family decisions. Models 3 and 4 also show the coefficient for low power reducing to nonsignificance after controls for health and health behavior, respectively, are added. This suggests that, for men, having low power in the relationship may influence mortality

through poorer health behaviors or poorer health. Model 5 provides some clarity to this complex

set of pathways by including all these measures. In this full model, both the marital quality measures *and* the socioeconomic measures (except the health insurance measure) are reduced to nonsignificance, while the health and health behavior measures remain significant predictors of mortality risk. Thus, for men, it seems that marital quality's effect on mortality risk may flow directly through health/health behavior, and additionally, in an indirect manner through socioeconomic impacts affecting mortality risk through further modifications of health and health behavior.

Even when controlling for all of the variables in the full model (Model 5 of Table 4), having been widowed or divorced more than two years significantly raises the hazard of divorce for men. Whereas reductions in socioeconomic status explain this effect for women, it does not for men, nor does accounting for health behaviors or health. Compared to men who remain married, men who transition to divorce and whose divorce has taken place at least two years prior have one and a half times the hazard of mortality. Men who have transitioned to widowhood more than two years prior have 1.33 times the mortality hazard of men who remain continuously married. DISCUSSION

We use longitudinal data from nine waves of the HRS to examine how marital quality and marital dissolution during later life are related to mortality, whether the relationships are different for men and women, and through what mechanisms these relationships might operate. Results show that both marital quality and marital dissolution are significant predictors of mortality. However, results also suggest that the relationships are different for men and women, as are the pathways via which marital quality and marital status affect mortality.

Our first objective was to investigate the relationship between marital quality and mortality among older adults. The limited body of existing literature on marital quality and mortality suggests that marital quality is linked to mortality, though differently for men and women (Coyne et al. 2001; Rohrbaugh et al. 2006; Tower et al. 2002). Our results support this contention. For men, perceived low power in their marriage is particularly important to mortality outcomes, whereas for women enjoyment of time with spouse is the only measure of marital quality significantly related to mortality. Research on marriage and mortality generally compares married individuals with the unmarried. Our findings indicate that there are important variations in mortality risk by quality of the relationship; it is not advisable to treat all married individuals as a homogenous group. Results also suggest unique influences of marital quality by gender. For women, it may be more important to consider quality of marital interaction, whereas for men it may be more important to gauge equity in the relationship.

It is important to note that our sample is comprised of individuals born before 1942. Cohort effects may be important in explaining these gender differences. These older men and women were socialized during a time when men were expected to have greater decision-making power in their marriages. Although expectations of women's power in relationships and role in the work and family spheres have undergone significant societal shifts since then, these older individuals may have carried more conservative gender attitudes throughout their life course. This may explain why perceptions of low power in the relationship are problematic for older men's mortality but not for older women's. We do not have measures of gender attitudes available in this study, but future research should investigate the role of gender ideology.

Our second objective was to investigate how marital quality may moderate the relationship between marital dissolution and mortality risk. Our study adds to the existing

literature by using prospective, longitudinal data to consider how both marital quality and the transition to marital dissolution may play a role in mortality risk. Results show that marital quality and marital status transitions appear to have independent effects. We do not find support for the possibility that marital dissolution increases mortality risk for those in happy marriages but decreases mortality risk for those in unhappy marriages. Instead, ending a marriage raises the hazard of mortality regardless of marital quality prior to the union dissolution, and the effect of union dissolution is long-term. This finding offers a word of caution to researchers: it is not enough to consider only marital quality or only marital dissolution; both have repercussions for the longevity of married individuals during the later life course.

However, dissolving a marriage during the later life course appears to mean something different for the mortality risk of men and women. For women, experiencing a later-life divorce is not associated with mortality. Moreover, although transitioning to widowhood raises the hazard of mortality for older women in the long-term, this is due to reduced socioeconomic status. For men, on the other hand, dissolving a marriage either through divorce or widowhood has long-term effects on mortality that cannot be explained by socioeconomic status, health, or health behavior changes. Though we control for number of children, we are not able to include controls for other sources of social support such as quality of and individual's broader social network. Research shows that women are more likely to act as "kin keepers" and the organizers of a couple's social life (di Leonardo 1987); men may lose this important connection to their social networks when they lose their wives.

Our final objective was to investigate potential mechanisms through which marital quality may influence mortality. For women, enjoyment of time with spouse is positively related to health, which in turn is positively related to mortality. This adds to the growing body of research documenting the health effects of marital dynamics (e.g., Hawkins and Booth 2005; Ren 1997; Umberson et al. 2006) by showing that not only is marital quality related to subjective health, but that it has farther-reaching implications for longevity. Whereas marital quality does not appear to affect mortality through improved health behaviors for women, controlling for either health behaviors or health reduces to nonsignificance the coefficient for low relationship power for men. Men

who perceive greater power in their relationships indeed evidence improved health behaviors and better health; however, men perceiving lower power do not.

There are several limitations of the current study. First, marital quality is measured only at baseline, and is not time-varying. Unfortunately, the marital quality measures in the 1992 wave of the HRS are not asked again of all married respondents in subsequent waves, a common data limitation in investigating marital quality and mortality. In fact, to our knowledge, only one study of the relationship between marital quality and mortality has examined how change in marital quality may affect mortality by examining prospective reports of marital quality at two different waves (Birditt and Antonucci 2008). Because we do not have a time-varying measure of marital quality, the effect of low marital quality on mortality outcomes is a conservative estimate; that is, some individuals' marital quality may have improved over time and others may have worsened. The worsening marriages are likely accounted for partly by subsequent divorces, whereas marriages that improve would have no noticeable change in status. Thus, the continuously married category may be biased toward lower initial marital quality, resulting in an overall conservative bias in our findings. Future research should utilize longitudinal data to examine how consistency and change in marital quality over the life course affects mortality risk.

Second, we have measures of only two positive dimensions of marital quality – marital satisfaction and interaction – as well as a measure of marital power. We are not able to examine

the role of negative aspects of marital quality such as disagreements or problems, nor are we able to examine a measure of perceived instability. In addition, we are not able to assess quality of support from non-spousal sources, which may moderate the effect of marital support on mortality (Birditt & Antonucci, 2008). Finally, because we begin with a sample of older adults who are already married, we are not able to address issues of selectivity. Scholars still debate the degree to which the health and mortality benefits of marriage are due to marital protection or rather just a selection effect whereby healthier people are more likely to become married. However, while previous research on marital status and mortality does find some selectivity operating (e.g., Nilsson et al. 2005; Tucker et al. 1996), a number of studies find that protective effects of marriage are far more salient to health and mortality outcomes than is selection (Dupre et al. 2009; Hemström 1996; Lamb, Lee, and DeMaris 2003; Lillard and Panis 1998).

This study has implications for the broader literature on marital status and health and gender in marriage, which point to several directions for future work. Though an increasing number of studies link marital quality with health outcomes (e.g., Ren, 1997; Umberson et al., 2006; Umberson & Montez, 2010), this study shows its implications are farther-reaching and consequential for the livelihood of older adults. Our findings thus contribute to the existing literature on marriage and well-being by showing that not all married adults benefit equally from marriage. The vast majority of existing research on mortality compares all married adults to those who are unmarried, which fails to account for the variety of marital experiences and dynamics that affect health and longevity. The comparatively little attention to marital quality as a predictor of mortality may be due to data limitations (i.e., many longitudinal data sets with sufficient mortality events do not contain measures of marital quality) or to assumptions that

marriage is universally beneficial via pathways such as greater economic well-being and

supportive partnership. Scholars may also assume that later-life marriages equate to long-term, high-quality marriages.

Our findings challenge these assumptions. There are significant variations in marital quality among the older individuals in this sample, and those with lower levels of marital quality have higher mortality rates. In addition, the older adults in this study reflect the broader societal trends toward higher divorce rates throughout the life course; one-quarter of the women and 30% of the men in the sample are in a remarriage, and almost five percent experience a later-life divorce during the sixteen years of observation. Our results suggest that researchers should avoid treating all married individuals as a homogenous group and should instead consider marital dynamics as an important correlate of mortality. Future research should extend our findings to compare separately those in happy and unhappy marriages to those who are unmarried. Moreover, research should be attentive to non-marital partnerships, such as cohabitation or living apart together (LAT) relationships, assessing the implications of the quality of these intimate unions. Finally, researchers should devote more attention to marital status transitions that happen during later life, such as divorce and remarriage.

Results of this study also contribute to the literature on gender in marriage, particularly during the later life course. We find that marital dynamics and marital dissolution affect longevity differently for men and women. Although power in the relationship is related to mortality for men, overall satisfaction with the relationship and quality of time with spouse are not significantly linked to mortality hazard. However, for men, dissolving the relationship through either divorce or widowhood significantly raises mortality risk, an effect that cannot be explained by accounting for socioeconomic, health, or health behavior changes. Women's higher mortality risk following widowhood, however, is explained mostly by their economic situation. This supports previous research suggesting that satisfaction with marital interaction is particularly important for women's longevity (Hankin and Abramson, 2001; Heaton and Blake 1999; Joyner and Udry, 2000), whereas marriage itself may be more beneficial to men (Bernard, 1972).

Results point to several potential avenues for policy and practice. Policymakers should particularly note our finding that women who experience widowhood after age 50 have a heighted mortality risk due to declines in socioeconomic status. This suggests that income security policies may be particularly important for widowed women's longevity. Further, recent governmental policies such as the Healthy Marriage Initiative seek to encourage formation and maintenance of marriages, particularly among low-income populations (Nock, 2005). The rationale for such policies rests in large part on research showing "marriage benefits" in terms of health and longevity. Our results suggest that encouraging the formation of marriages that are not of self-rated high-quality may be problematic for mortality, particularly for women. Results also suggest that interventions for those in unhappy marriages, such as marital counseling, may have beneficial impacts on mortality if such interventions are able to translate into improvements in marital quality. Finally, physicians and other health care professionals should note that there are tangible consequences of marital quality for mortality outcomes and potentially assess dynamics of marital relationships or interventions for those in unhappy relationships.

NOTES

[1] Those who are excluded due to missing data on the marital quality measures are significantly more likely to be smokers and problematic drinkers, less likely to have health insurance or have visited a doctor, have lower subjective health, and have higher activities of daily living (ADL) limitations and body mass index (BMI) at baseline, on average, than those who are not missing data on the marital quality questions. They are also more likely to die or become divorced over the course of observation. Those who are excluded from the sample due to nonresponse in all subsequent waves do not differ significantly from the analytic sample in terms of baseline marital quality; they are, however, less likely to smoke and have fewer children in contact, on average, at baseline (analysis not shown; results available upon request from authors).

[2] Because of concerns that age and marital duration may be too highly collinear, we used OLS regression models in SAS statistical software to examine the variance inflation factor (VIF) for all variables in the full model. The VIF values are all below three, well within the acceptable range, suggesting that mulitcollinearity is not a problem in the multivariate analyses (DeMaris, 2004).

[3] The full models for both the combined sample as well as for the separate samples of men and women are estimated. Then, a Chi-squared test with degrees of freedom being the difference in parameters between the combined sample and the two separate samples (DeMaris, 2004: 283) is conducted:

$X^2 = -2 \log \text{likelihood}_{(c)} - [-2 \log \text{likelihood}_{(m)} + -2 \log \text{likelihood}_{(f)}]$ Where *c* represents the combined sample, *m* represents the male sample, and *f* represents the female sample. Models utilize the "survey logistic" command in SAS statistical software, which applies the survey weights and produces the estimated log-likelihood statistics. The test is statistically significant ($X^2 = 116.875$; df = 25; $p < 0.001$), suggesting sufficient statistical evidence that the effects of the covariates differ for men and women (DeMaris, 2004).

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Table 1. Weighted Means and Standard Errors of All Variables, by Gender

Significant gender difference: *p < 0.05 **p < 0.01 ***p < 0.001 Note: Means for all time-vary independent variables (with exception of marital status outcomes)

Table 2. Discrete-Time Event History Models for Mortality by Gender, Net of Marital Quality and Marital Dissolution

Hazard Hazard Hazard Hazard Hazard Hazard

n=7,388 *p < 0.05 **p < 0.01 ***p < 0.001 [a] Reference category is continuously married. [b] Reference category is non-Latino White. Note: Analysis uses HRS survey weights to correct for complex sampling design.

Table 3. Discrete-Time Event History Models Predicting Mortality Hazard for Women

n=7,388 *p < 0.05 **p < 0.01 ***p < 0.001 [a]Reference category is continuously married. [b]Reference category is non-Latino White. Note: Analysis uses HRS survey weights to correct for complex sampling design.

Table 4. Discrete-Time Event History Models Predicting Mortality Hazard for Men

	Model 1		Model 2		Model 3		Model 4	
	b	Hazard	b	Hazard	b	Hazard	b	Hazard
Satisfied with Marriage	0.324	1.38	0.294	1.34	0.277	1.32	0.315	1.37
Quality of Interaction Low	-0.058	0.94	0.040	1.04	-0.064	0.94	0.038	1.04
Power	0.051	1.05	0.035	1.04	0.066	1.07	0.023	1.02
Divorced < 2 Years[a]	0.080	1.08	0.106	1.11	0.172	1.19	-0.015	0.99
Divorced ≥ 2 Years[a]	0.337 *	1.40	0.510 **	1.67	0.472 **	1.60	0.401 **	1.49
Widowed < 2 Years[a]	-0.200	0.82	-0.125	0.88	-0.108	0.90	-0.236	0.79
Widowed ≥ 2 Years[a]	0.272 *	1.31	0.375 *	1.46	0.350 *	1.42	0.276 *	1.32
Age	0.094 ***	1.10	0.076 ***	1.08	0.092 ***	1.10	0.080 ***	1.08
Black[b]	0.038	1.04	-0.015	0.98	0.243 **	1.28	-0.059	0.94
Latino[b]	-0.366 **	0.69	-0.353 **	0.70	0.118	1.13	-0.363 *	0.70
Other Race-ethnicity[b]	-0.311	0.73	-0.320	0.73	-0.172	0.84	-0.537	0.58
Children	-0.008	0.99	-0.015	0.99	0.005	1.01	-0.014	0.99
Marital Duration	0.006	1.01	0.004	1.00	0.008	1.01	0.005	1.01
Remarriage	0.290 **	1.34	0.212 *	1.24	0.272 **	1.31	0.194	1.21
Education	-0.031 **	0.97					0.016	1.02
Household Income (Log)	-0.078 ***	0.93					-0.015	0.99
Wealth (Log)	-0.031 ***	0.97					-0.008	0.99
Health Insurance	-0.981 ***	0.37					-0.678 ***	0.51
Subjective Health			-0.672 ***	0.51			-0.642 ***	0.53
ADL Limitations			0.205 ***	1.23			0.212 ***	1.24
Currently Smoke					0.732 ***	2.08	0.468 ***	1.60
					-0.190	0.83	-0.147	0.86

n=7,388 *p < 0.05 **p < 0.01 ***p < 0.001 [a] Reference category is continuously married. [b] Reference category is non-Latino White. Note: Analysis uses HRS survey weights to correct for complex sampling design.