Life Expectancy Differentials by Marital Status, Individuals' Own Education, and Spousal Education in the United States[†]

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ABSTRACT

Education and marriage each share an inverse association with mortality, but it is not clear whether education and marital status combine to influence mortality. Moreover, even fewer studies have examined whether a spouse's education contributes to marital status differences in mortality. This paper examines whether education and marriage intersect to influence life expectancy. The paper also examines whether spousal education contributes to mortality disparities between married and unmarried persons. Life tables estimated from the U.S. National Health Interview Survey Linked Mortality Files (1986-2006) suggest that education and marriage intersect to influence life expectancy and that spousal education substantially contributes to marital status disparities in life expectancy. The results also imply that focusing only on the relationship between individuals' own education and life expectancy among the married masks substantial heterogeneity within educational groups attributable to spousal education. The findings illustrate how family processes and socioeconomic factors combine to influence mortality.

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Education and marriage are powerful determinants of longevity. An inverse association between education and U.S. adult mortality was documented as early as 1960 (Kitagawa and Hauser 1973) and subsequent research suggests the mortality gap between the least and most educated persons has grown wider over time (Elo 2009; Hummer and Lariscy 2011; Jemal et al. 2008; Meara, Richards and Cutler 2008; Montez et al. 2011; Pappas et al. 1993; Preston and Elo 1995). Similarly, evidence of mortality disparities between married and unmarried adults in the U.S. have existed since at least the early 1950s (Berkson 1962; Kraus and Lilienfeld 1959) and subsequent research consistently shows that married adults live longer on average than their unmarried counterparts (Carr and Springer 2010; Gove 1973; Liu 2009; Manzoli et al. 2007; Rogers 1995; Umberson and Montez 2010; Waite and Gallagher 2001). Although selection partially explains the inverse association between marriage and mortality (Fu and Goldman 1996; Goldman 1993; Lillard and Panis 1996; Williams and Umberson 2004), the available evidence generally suggests that this association is causal (Carr and Springer 2010; Ross, Mirowsky and Goldsteen 1990; Waite and Gallagher 2001; Wood, Goesling and Avellar 2007). Recent research also suggests that the positive association between educational attainment and longevity is causal (Cutler and Lleras-Muney 2006; Kawachi, Adler and Dow 2010; Lleras-Muney 2005).

Although it is clear that education and marriage each share an inverse association with adult mortality, it is not clear whether education and marital status combine to influence adult mortality. Moreover, even fewer studies – especially in the United States – have examined

whether a spouse's education contributes to the mortality advantage married persons enjoy relative to their unmarried counterparts. Therefore, this paper examines how education and marital status intersect to influence life expectancy in the United States. The analyses specifically address two unresolved questions. How large are mortality differentials between men and women in different marital status groups at different points in the educational distribution? Does spousal education contribute to mortality disparities between married and unmarried persons?

BACKGROUND

Education (Baker et al. 2011; Brown et al. 2012; Mirowsky and Ross 2003; Phelan et al. 2004) and marriage (Carr and Springer 2010; Waite 2000; Waite and Gallagher 2001) respectively provide individuals with vast material and non-material resources that ultimately allow them to live longer, healthier lives. The socioeconomic, behavioral, and psychosocial resources respectively provided by education and marriage are similar in many respects. Thus, it is plausible that education and marriage intersect to either increase or decrease one's risk of death because the resources they respectively provide mutually reinforce one another. Indeed, the few studies that have examined education-marital status differences in mortality suggest that this is case (Kohler et al. 2008; Montez et al. 2009).

Moreover, evidence for an association between spousal education and adult mortality is sparse – especially in the United States. A growing body of research consistently documents an inverse association between spousal education and various adverse health outcomes (Bosma et al. 1995; Egeland et al. 2002; Huijts, Monden and Kraaykamp 2010; Jaffe et al. 2005; Jaffe et al. 2006; Kravdal 2008; Martikainen 1995; Monden et al. 2003; Skalická and Kunst 2008; Torssander and Erikson 2009). Overall, these studies suggest that exclusively focusing on the

health consequences associated with individuals' own education fails to recognize the considerable role that spousal education plays in shaping health outcomes both within marriage and between marital status groups. These studies contest the overly individualistic approach taken in most extant research on education and adult health/mortality and suggest instead that the resources available via individuals' educational attainment is a pooled or household resource within marriage. Most of these studies examine data drawn from European populations and it is unclear whether a similar association between spousal education and mortality exists in the United States. Most (Haveman et al. 1994; McDonough et al. 1999; Smith and Kington 1997; Smith and Zick 1994), but not all (Lillard and Waite 1995), of the few extant nationally representative studies in the United States to assess this association suggest that spousal education is not associated with adult health/mortality.

The lack of research on spousal education and adult mortality, particularly in the United States, is surprising given the recent interest in how the social context shapes health. The household and family are the most salient contexts in which social factors shape individuals' health (Ross, et al. 1991). Marriage is the most important social relationship in which adults typically involve themselves. Moreover, the complex and deeply held social, emotional, legal, and economic ties that spouses share generally engender feelings of concern for each other's well-being and these feelings inherently motivate spouses to pool their respective material and non-material resources in an attempt to improve their own and their partner's well-being (Becker 1991; Huijts et al. 2010; Jacobson 2000; Monden et al. 2003). Consequently, the dearth of research on spousal education and mortality, especially in the United States, limits our ability to understand how family processes and socioeconomic factors jointly influence individual-level health outcomes.

This paper examines life expectancy disparities between men and women in different marital status groups at different points in the educational distribution. The paper also evaluates the extent to which a spouse's education contributes to educational differences in life expectancy between married and unmarried persons. The analyses draw on data from the 1986-2006 NHIS-LMF and employ a multivariate life table approach (Teachman and Hayward 1993) to quantify the extent to which the mortality advantage that married men and women enjoy over their unmarried counterparts actually is due to one's own and a spouse's educational attainment. The analyses compare gender-specific life expectancy at age 55 across education-marital status groups. Life expectancies are compared because they provide a convenient way to assess absolute differences in mortality across education-gender-marital status groups. The analyses provide an important window into how two major social resources – educational attainment and marriage – combine to influence mortality among U.S. adults.

METHODS

Data

The data come from the 1986-2006 public-use National Health Interview Survey Linked Mortality Files (NHIS-LMF). The data were downloaded from the Integrated Health Interview Series (IHIS) website (Minnesota Population Center 2012). The NHIS-LMF contains interviews from the 1986-2004 NHIS probabilistically linked to mortality records in the U.S. National Death Index (NDI) through December 31, 2006. The NHIS is a nationally representative cross-sectional survey of the U.S. non-institutionalized, civilian population conducted annually by the U.S. National Center for Health Statistics (NCHS). The NDI is an archive of U.S. death records maintained by NCHS. A recent validation study concluded that mortality estimates from the

NHIS-LMF closely correspond with estimates from U.S. vital statistics data (Ingram, Lochner and Cox 2008). Additional information about the matching procedure used to create the NHIS-LMF (National Center for Health Statistics 2009) and the comparability of mortality estimates between the NHIS-LMF and U.S. vital statistics (Ingram et al. 2008; Lariscy 2011; Lochner et al. 2008) is available elsewhere.

The analyses were restricted to non-Hispanic white and non-Hispanic black respondents ages 25-84 at interview who were eligible for mortality follow-up and had complete information on all the variables in the models. The analyses exclude respondents ages 18-24 at interview to ensure that most respondents had completed their formal schooling and an upper age limit of 84 was imposed to improve data quality and eliminate age top-codes. The analyses were further restricted to non-Hispanic whites and non-Hispanic blacks. This was done primarily to improve data quality because prior research suggests that mortality estimates from the NHIS-LMF and U.S. vital statistics data are most comparable among non-Hispanic whites and non-Hispanics blacks (Ingram et al. 2008; Lariscy 2011). Given that the NHIS did not collect information on nativity status prior to the 1989 survey, restricting the sample to non-Hispanic whites and non-Hispanic blacks also minimizes the possibility that respondents were foreign-born, which improves overall data quality (Lariscy 2011) and reduces the likelihood that respondents obtained their education outside the United States.

A relatively small proportion of married non-Hispanic white and non-Hispanic black respondents between the ages of 25 and 84 at interview were excluded. These respondents primarily were excluded because the process used to link spousal characteristics excluded married respondents who were not listed on the NHIS household roster as the household reference person or the spouse of the household reference person. This approach excludes a

relatively small number of married persons who reside in households that contain multiple married couples, but it was necessary to match spousal characteristics in the NHIS-LMF. A few additional married respondents were excluded from the sample because their spouses were missing one or more of the variables in the models (i.e., mortality status, age, race-ethnicity, marital status, and/or education), they did not meet the age-eligibility criteria outlined above (i.e., 25-84 at interview), and/or they were not non-Hispanic white or non-Hispanic black. A few respondents in same-sex marriages also were excluded. After imposing these restrictions and listwise deleting observations with missing values, the final sample contained 890,762 individual respondents and 140,438 decedents.

Measures

The dependent variable is all-cause mortality risk (0 = survived, 1 = died). Mortality status comes from the NDI. Exposure to the risk of death was measured in years. For decedents, exposure represents the number of years elapsed between their NHIS interview and the date they died. For survivors, exposure represents the number of years elapsed between their NHIS interview and December 31st, 2006. The quarter of interview was used to impute missing interview months and interviews were assumed to occur mid-quarter when the interview month was missing (about 0.3% of respondents). The public-use NHIS-LMF contains the year and quarter of death. Decedents were randomly assigned a month of death within the quarter in which they died. Decedents who were interviewed and died in the same quarter (< 0.4%) were assigned half a quarter of exposure. All interviews and deaths were assumed to occur mid-month.

The independent variables include marital status, education, spouse's education (married respondents only), gender, race-ethnicity, and age in years. All independent variables were self-reported. Marital status refers to respondents' current legal marital status at the time of their

NHIS interview. Marital status was categorized into three mutually exclusive groups: married, never married, or previously married. The previously married group combines divorced/separated and widowed respondents. Ancillary analyses were also conducted that combined all unmarried (divorced/separated, widowed, never married) respondents into one group and separated-out divorced/separated and widowed respondents (not shown, but available on request). To minimize redundancy and facilitate interpretation, I only present results for the married, never married, and previously married (i.e., divorced/separated or widowed) groups. Note that marital status is measured at the time of respondents' NHIS interviews. The NHIS-LMF does not contain information about subsequent marital status transitions. The results should be viewed in light of this limitation because some of the marriages recorded in the NHIS inevitably dissolved during the follow-up period.

Education in completed years was grouped into four mutually exclusive categories that roughly correspond to less than a high school education (0-11 years), a high school education (12 years or G.E.D.), some college education (no Bachelor's degree, 13-15 years) and a college education or higher (Bachelor's degree or higher, 16 or more years). Spouse's education was categorized the same way (married respondents only). College graduates were the reference group in the regression models. Gender (Men = 0, Women = 1) was measured dichotomously. The models also control for individuals' own race-ethnicity (1 = non-Hispanic black, 0 = non-Hispanic white) and a linear term for age in years.

Methods

The data were restructured into person-year format prior to estimating the models and age, mortality status, and exposure were allowed to vary over time. Decedents were removed from the risk-set once they died and survivors were censored on December 31st 2006. Decedents were

assigned a partial year of exposure the year they were interviewed, a full year of exposure for each year they survived, and a partial year of exposure in the year they died. Survivors were assigned a partial year of exposure in their interview year and a full year of exposure each year thereafter. Partial years of exposure were calculated based on interview and/or death months. Age in years was top-coded at age 100 to close the life tables.

Once the person-year file was created, separate Exponential regression models were estimated for respondents in each respective gender-marital status group. Two models were estimated for married respondents and one model was estimated for unmarried respondents. For married men and women, the first model regressed all-cause mortality risk on married men's and women's own education, own race-ethnicity, and own age in years. This model establishes the total association between married men's and women's own education and the risk of death net of race-ethnicity and age. The second model for married men and women regressed all-cause mortality risk on individuals' own education, their spouse's education, own race-ethnicity, and own age in years. This model estimates the extent to which various combinations of own and spousal education influence married men's and women's risk of death net of one's own race-ethnicity and age. Models interacting married men and women's own education with their spouse's education were also estimated, but these results are not shown because the interactions were not statistically significant.

The gender-specific models estimated within each unmarried group regressed all-because mortality risk on unmarried men's and women's own education while controlling for race-ethnicity, and age. This model provides estimates of the total association between unmarried men's and women's education net of race-ethnicity and age. Note that this model provides a way to directly evaluate the relative importance of individuals' own education on the risk of death

across the married, never married, and previously married groups because it is identical to the first model estimated for married men and women. The analyses were weighted and the survey analysis commands in Stata version 12.1 were used to account for the complex sample design in the NHIS-LMF. To ensure that the sample represents the U.S. civilian population on average between 1986 and 2004, the sample weights were divided by the number of NHIS cross-sections pooled (i.e., nineteen) in the analyses (Minnesota Population Center 2012).

The final step in the analysis was to construct life tables stratified by gender, marital status, and education using a multivariate life table approach (Teachman and Hayward 1993). Parameter estimates from the regression models were used to calculate age-specific predicted death rates within each respective gender-education-marital status group. The predicted death rates were calculated for non-Hispanic white respondents within each respective gender-education-marital status group (i.e., the variable representing race-ethnicity was fixed to zero). Death rates obtained via this approach are analogous to exponentially smoothed occurrence-exposure rates. This is the m_x decrement in the life table. The life tables contain simulated mortality histories for a hypothetical cohort of 100,000 non-Hispanic white men and women exact ages 25 through exact ages 100 and over.

To evaluate data quality, I conducted ancillary analyses (not shown) that compared the gender-specific life tables estimated from the NHIS-LMF and with life tables estimated from U.S. vital statistics data. Overall, the life tables generated from the NHIS-LMF sample used in the analyses and U.S. vital statistics data were very similar. However, mortality rates in the NHIS-LMF were slightly lower than U.S. vital statistics rates and as a result, life expectancies generated from the NHIS-LMF were about one year higher on average than life expectancies based on U.S. vital statistics. Other research in the United States documents similar discrepancies

between life expectancies generated from nationally-representative surveys and vital statistics data (Brown et al. 2012; Lin et al. 2003). These differences largely arise because the NHIS only includes the non-institutionalized civilian population while the life tables based on the U.S. vital statistics data include institutionalized and non-institutionalized populations. The fact that my analytic sample only included non-Hispanic whites and non-Hispanic blacks also contributed to discrepancies between the NHIS-LMF-based and U.S. vital statistics-based life tables because the vital statistics rates included all race-ethnic groups.

[INSERT TABLE 1]

[INSERT TABLE 2]

RESULTS

Descriptive Statistics

Table 1 contains descriptive statistics for men and women in the sample by marital status at interview. The table reveals notable gender and marital status variations in the distribution of deaths. These differences were most evident among married men and women. Almost twice as many married men (15.1%) than women (8.8%) died during follow-up. In comparison, the proportion of deaths was only about 12 percent higher among never married men (8.2%) and women (7.2%), whereas slightly more previously married women (23.7%) than men (21.7%) actually died during the follow-up period.

Table 1 also shows that individuals' own education was distributed differently across gender-marital status groups. Overall, previously married men were the least educated group among men and education was distributed similarly among married and never married men. Similar to men,

educational levels were lower among previously married women relative to married and never married women, but unlike men education was not distributed similarly among married and never married women. Considerably more never married (32.3%) than married (23.4%) women were college educated, but more married (40.0%) than never married (30.4%) women graduated high school. The educational distributions for men and women within marital status groups were similar. However, more married men (28.6%) than women (23.4%) possessed a four-year college degree, but slightly more never married women (32.3%) than men (29.3%) were college graduates. The distributions for spousal education among married men and women was very similar to the distributions for own education. Although not shown, ancillary analyses revealed that educational homophily was the overwhelming norm among married couples. This more general pattern is implied by Table 2, which shows the number of deaths within each respective gender-education-marital status group.

The race-ethnic composition of the sample also varied substantially by gender and marital status. More non-Hispanic blacks than non-Hispanic whites were unmarried. The sample contained relatively few married non-Hispanic black men (8.5%) and women (7.7%), while the proportion of never married (19.0%) and previously married (16.7%) non-Hispanic black men was roughly double that of married (8.5%) non-Hispanic black men. The sample contained around three times as many never married (19.0%) non-Hispanic black women as married non-Hispanic black women (7.7%). There were about twice as many previously married (16.7%) non-Hispanic black women than married (7.7%) non-Hispanic black women. Finally, previously married men and women were older than previously married men and women, while never married men and women were about ten years younger on average than their married and previously married counterparts.

[INSERT TABLE 3]

[INSERT TABLE 4]

Life Expectancy

Tables 3 and 4 display life expectancies at exact age 55 (e_{55}) for each respective gender, education, and marital status group. Life expectancy at exact age 55 is shown because ancillary analyses (not shown) indicated that gender, marital status, and educational differences in all-cause mortality risk generally were greatest around this age. Although this choice was somewhat arbitrary, examining life expectancy at other ages yields similar substantive conclusions. Table 3 displays life expectancies for married, never married, and previously married men disaggregated by own education and, for married men, their spouse's education. Table 4 displays life expectancies for married, never married, and previously married women disaggregated by own education and spouse's education (married women only). The last two columns in each table show the difference in life expectancy between married persons within each respective educational group and the never married and previously married groups. The rows labeled "Overall" contain life expectancies at age 55 calculated from models that regressed all-cause mortality risk on own education, race-ethnicity, and age in years within each respective gender-marital status group. The rows labeled "Spouse" contain life expectancies at age 55 for different combinations of own education and spousal education. Recall that these results are based on gender-specific models that regressed all-cause mortality risk on own education, spouse's education, race-ethnicity, and age in years among married men and women.

As expected, Tables 3 and 4 show that life expectancy at age 55 was higher among married persons than it was among never married or previously married persons. This general pattern was evident among men and women at all points in the educational distribution. Life expectancy differentials between married and unmarried men often were slightly larger in comparison to those between married and unmarried women. Although these differences typically were not dramatic, they are consistent with prior research on marriage and adult mortality (Kaplan and Kronick 2006; Liu and Umberson 2008; Rogers 1995; Waite and Gallagher 2001) that suggests marriage is a more important health resource for men than women. These results possibly imply that marriage is a more important determinant of life expectancy among men than women, but the evidence for this is not overwhelming. Life expectancy at age 55 was higher among women in comparison to men within each respective education-marital status group. Although the actual size of the gender gap in life expectancy varied across education-marital status groups, the results suggest that life expectancy at age 55 is around five years higher (Range: 4.2 to 5.8 years) for women than men across all education-marital status groups.

Not surprisingly, the results also reveal an inverse gradient between individuals' own education and life expectancy among men and women within each respective marital status group. Life expectancy at age 55 was highest among college-educated married men (e_{55} = 28.8) and women (e_{55} = 33.6) and lowest among never married men (e_{55} = 19.7) and women (e_{55} = 24.6) who did not graduate high school. Tables 3 and 4 also strongly suggest that education and marital status coalesce to influence life expectancy. Considerable gender gaps in life expectancy also were present across education-marital status groups. For example, the results in Tables 3 and 4 imply that married women with a college education (e_{55} = 33.6) can expect to live almost five years longer than college-educated married men (e_{55} = 28.8) and more than ten years longer than

married men who did not complete high school (e_{55} = 23.1). The results also implied that at age 55 married men with a college education (e_{55} = 28.8) only have a 1.5 year life expectancy advantage over married women without a high school diploma (e_{55} = 27.3).

Spousal education also appears to play a key role in shaping mortality disparities between education-marital status groups. This is important because it implies that focusing only on the relationship between individuals' own education and life expectancy among the married masks substantial heterogeneity within educational groups attributable to spousal education. For example, the life expectancy gap at age 55 between married women who dropped out of high school (e_{55} = 27.3) and married women with a college education (e_{55} = 33.6) was 6.3 years when spousal education was not taken into account. However, the results suggest that husbands' education substantially contributes to the life expectancy gap observed between the least and most educated wives. There was a 7.5 year life expectancy gap between married women without a high school diploma whose husband also did not complete high school (e_{55} = 26.9) and college-educated women whose husband also graduated college (e_{55} = 34.4). The results for married men mirrored those for married women.

To the extent that these results are causal and not due to selection processes, they imply that "marrying-up" (i.e., educational hypergamy) and "marrying-down" (i.e., educational hypogamy) have important health consequences. Specifically, the results imply that educational hypogamy reduces life expectancy, while educational hypergamy increases life expectancy. Indeed, the results suggest that life expectancy at age 55 among men and women who do not have a college education themselves, but who are married to a college-educated spouse is more akin to married persons in next highest educational category than it is to their similarly educated counterparts overall. The link between educational heterogamy and life expectancy implied by the analyses is

most evident among married men and women who graduated college. For example, the results suggest that among married men and women with a college education, life expectancy at age 55 was about three years lower among men (e_{55} = 26.8) and women (e_{55} = 31.4) whose spouse did not complete high school relative to men (e_{55} = 29.6) and women (e_{55} = 34.4) in educationally homogamous marriages. Educational hypogamy appears to exert a sizable effect on life expectancy at age 55 among married persons with a college education. The results also imply that life expectancy at age 55 among married men (e_{55} = 26.8) and women (e_{55} = 31.4) with a college degree whose spouse who did not complete high school was about two years lower than the life expectancy found among married college educated men (e_{55} = 28.8) and women (e_{55} = 33.6) as a whole. Educational hypergamy among married couples has a greater effect on life expectancy at the lower-end of the educational distribution. This possibly implies that being married to a spouse with a college education is less advantageous for college-educated individuals and more advantageous for persons without a college education.

Finally, comparing life expectancies across education-marital status groups also provides a window into the contribution that spousal education has on mortality disparities between married and unmarried groups. This is most apparent among men and women at the extremes of the educational distribution. For example, the overall life expectancy gap at age 55 between married (e_{55} = 23.1) and never married (e_{55} = 19.7) men without a high school diploma is 3.4 years. However, the life expectancy gap between never married men without a high school diploma and men without a high school diploma married to a college graduate is 5.3 years (i.e., e_{55} = 19.7 vs. e_{55} = 25.0). The same pattern was evident among college-educated men and women, but the results imply that the life expectancy advantage associated with spousal education is much less pronounced among college-educated men and women in educationally homogamous marriages.

DISCUSSION

Despite clear evidence that education and marriage each share an inverse association with adult mortality, evidence for an association between spousal education and adult mortality is sparse. Moreover, the relatively few existing studies that examine the association between spousal education and adult mortality often do not systematically compare married and unmarried groups. Consequently, the extent to which spousal education contributes to mortality disparities between married and unmarried groups is unclear. The analyses in this paper contribute to this relatively underdeveloped research area and clarified the extent to which mortality levels among married men and women at different points in the education distribution compare to their unmarried counterparts. The analyses also capitalized on life table techniques to simulate the extent to which the mortality advantage that married men and women enjoy over their unmarried counterparts actually is due to individuals' own education and their spouse's educational attainment among a hypothetical cohort of individuals drawn from the 1986-2006 NHIS-LMF.

Several important findings emerged from the analyses. First, marriage was associated with higher life expectancy at age 55 among men and women at all points in the educational distribution. Although life expectancy differentials between married and unmarried men often were slightly larger in comparison to those between married and unmarried women, these differences were not dramatic. Second, as expected, the results suggested that women had substantially higher life expectancy at age 55 than men within each respective education-marital status group. Third, an inverse association existed between individuals' own education and life expectancy at age 55 across all gender-marital status groups. All the patterns outlined above generally were expected based on prior research (Kohler et al. 2008; Montez et al. 2009).

Fourth, the results strongly suggest that individuals' own education and marital status act in tandem to influence life expectancy. Life expectancy was highest among married individuals with a college education and lowest among never married individuals who did not graduate high school. These findings are consistent with previous research in the United States (Kohler et al. 2008; Montez et al. 2009) and European countries (Kohler et al. 2008) that suggests individuals' own education is a major reason that the married typically live longer than unmarried persons. Moreover, marital status differences in life expectancy at age 55 narrowed, but did not completely disappear, as individuals' own education increased. This possibly implies that the resources provided by unmarried individuals' own education compensate and/or substitute for the resources they do not possess because they are not married (Ross and Mirowsky 2006, 2010). Although this is a definite possibility, it is impossible to rule-out the possibility that selection effects actually are responsible for this association.

Fifth, the results strongly suggest that spousal education plays a critical role in shaping mortality disparities across marital status groups. The results suggest that failing to incorporate spousal education leads to an underestimation of the actual amount of heterogeneity that surrounds mortality risks within education-marital status groups. This especially is true for men and women at the lower-end of the educational distribution. Finally, as expected, the results suggest that spousal education plays a considerable role in shaping mortality disparities between married, never married, and previously married individuals. These results are important conceptually because they challenge the overly individualistic assumptions that guide most prior research on education and adult mortality and suggest instead that education is pooled or household resource within a particular type of social relationship – marriage.

Although these analyses advance our understanding of the link between spousal education and mortality in the United States, it also has several notable limitations. First, the structure of the NHIS-LMF is a limitation because it does not contain any information about marital status transitions after the initial NHIS interview and some marriages initially observed in the NHIS inevitably dissolved during the follow-up period. However, the problems that unobserved marital status transitions post-interview present may be mitigated somewhat by a recent Scandinavian study that found that the education of a former spouse still influences the risk of death (Kravdal 2008). This may or may not be the case in the U.S. context though. Future research should examine this issue more carefully. Second, the analyses do not account for selection into marital status groups. Future research should carefully examine issues related to selection both into various marital status groups overall and within marriage among educationally heterogamous couples. Third, assortative mating is occurring and inevitably influencing the results. However, there is no way definitive to deal with this problem in the NHIS-LMF. Future analyses using panel data should delve into this issue and attempt to correct the estimates accordingly. Finally, the models omit important mechanisms (i.e., income, wealth, health behaviors, the presence of children, etc.) that likely influence the association between education, marriage, and life expectancy. The purpose of the analysis was to provide a broad overview of the associations between education, marital status, and life expectancy. At any rate, the NHIS-LMF does not contain good measures for many of these mechanisms. However, this issue deserves attention in future research using datasets that longitudinally measure these and other potential mechanisms.

Despite these limitations, the results strongly suggest that education is a household resource within marriage. More importantly, the results imply that failing to incorporate spousal education in analyses linking marriage and education to adult mortality underestimates the actual amount

of heterogeneity that exists within education-marital status groups. This especially is true for individuals with relatively low levels of educational attainment. The results suggest that researchers should seriously contemplate including spousal education in analyses that examine educational differences in adult mortality.

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Table 1. Descriptive Statistics for Men and Women Ages 25 and Older in the Sample By Marital Status at Interview: NHIS-LMF, 1986-2006

	Men						Women					
	Married (n = 296,563)		Never Married (n = 56,372)		Previously Married (n = 56,459)		Married (n = 296,563)		Never Married (n = 52,896)		Previously Married (n = 131,909)	
	n	%	n	%	n	%	n	%	n	%	n	%
Own Education												
< High school	49,236	15.1	8,229	13.1	13,704	22.1	39,050	12.0	7,662	12.6	36,530	25.4
High school	103,391	34.3	19,339	33.6	20,405	36.5	121,644	40.0	16,927	30.4	49,954	37.9
Some college	62,602	22.0	13,026	23.9	12,360	23.0	70,266	24.7	12,562	24.6	28,542	22.9
College	81,334	28.6	15,778	29.3	9,990	18.4	65,603	23.4	15,745	32.3	16,883	13.7
Spouse's Education												
< High school	39,050	11.9					49,236	15.1				
High school	121,644	39.9					103,391	34.3				
Some college	70,266	24.7					62,602	22.0				
College	65,603	23.4					81,334	28.7				
Non-Hispanic black	29,888	8.5	12,265	19.0	11,631	16.7	29,005	7.7	19,334	30.8	30,606	18.0
Age at interview (mean)		49.3		36.7		51.5		47.0		38.6		57.3
Dead	51,403	15.1	5,473	8.2	14,114	21.7	30,038	8.8	4,405	7.2	35,005	23.7

Notes. The sample includes men and women ages 25-84 at the time of their NHIS interview. The "Previously Married" group includes respondents who were widowed or divorced/separated at the time of their NHIS interview. The "Married" group includes respondents who 1.) were married at the time of their NHIS interview; 2.) had complete information regarding their spouse's education; and 3.) was married to a non-Hispanic white or non-Hispanic black spouse between the ages of 25 and 84 at interview. The analyses include respondents who 1) were eligible for mortality follow-up in the NDI; 2) non-Hispanic white or non-Hispanic black; and 3) had complete information on the variables in the models. The interviews took place during the 1986-2004 NHIS survey years. Deaths occurred between the interview date (i.e., January 1986 - December 2004) and December 31st, 2006.

Table 2. Number of Deaths for Men and Women by Own Education, Spouses' Education, and Marital Status: NHIS-LMF, 1986-2006

	Men			Women		
	Married	Never Married	Previously Married	Married	Never Married	Previously Married
< High School						
Overall	18,555	1,964	6,193	9,547	1,498	16,035
Spouse: < High School	10,428			6,705		
Spouse: High School	6,679			2,192		
Spouse: Some College	1,108			489		
Spouse: College Graduate	340			161		
High School						
Overall	17,483	1,799	4,254	12,975	1,545	11,926
Spouse: < High School	3,332			3,673		
Spouse: High School	10,767			5,999		
Spouse: Some College	2,424			1,956		
Spouse: College Graduate	960			1,347		
Some College						
Overall	7,530	900	2,059	4,556	642	4,572
Spouse: < High School	733			598		
Spouse: High School	3,360			1,329		
Spouse: Some College	2,443			1,329		
Spouse: College Graduate	994			1,300		
College Graduate						
Overall	7,835	810	1,608	2,960	720	2,472
Spouse: < High School	230			184		
Spouse: High School	2,238			482		
Spouse: Some College	2,158			497		
Spouse: College Graduate	3,209			1,797		

Notes. The sample includes men and women ages 25-84 at the time of their NHIS interview. Age in years was top coded at 100+ in the analyses in order to close the life tables. The analyses were further restricted to respondents who 1) were eligible for mortality follow-up in the NDI; 2) non-Hispanic white or non-Hispanic black; and 3) had complete information on the variables in the models. The interviews took place during the 1986-2004 NHIS survey years. Deaths occurred between the interview date (i.e., January 1986 - December 2004) and December 31st, 2006.

Table 3. Life Expectancy at Exact Age 55 for *Men* by Own Education, Spouses' Education, and Marital Status at Interview: NHIS-LMF, 1986-2006

	Life Expectancy at Age 55 (e_{55})			Married vs.	
	Married	Never Married	Previously Married	Never Married	Previously Married
< High School					
Overall	23.1	19.7	19.9	*3.4*	*3.2*
Spouse: < High School	22.5			*2.8*	*2.6*
Spouse: High School	23.7			*4.0*	*3.8*
Spouse: Some College	24.1			*4.4*	*4.2*
Spouse: College Graduate	25.0			*5.3*	*5.1*
High School					
Overall	24.9	22.4	21.8	*2.5*	*3.1*
Spouse: < High School	23.8			*1.4*	*2.0*
Spouse: High School	25.0			*2.6*	*3.2*
Spouse: Some College	25.5			*3.1*	*3.7*
Spouse: College Graduate	26.4			*4.0*	*4.6*
Some College					
Overall	25.9	22.7	22.5	*3.2*	*3.4*
Spouse: < High School	24.4			*1.7*	*1.9*
Spouse: High School	25.7			*3.0*	*3.2*
Spouse: Some College	26.1			*3.4*	*3.6*
Spouse: College Graduate	27.1			*4.4*	*4.6*
College Graduate					
Overall	28.8	27.4	25.4	*1.4*	*3.4*
Spouse: < High School	26.8			*-0.6*	*1.4*
Spouse: High School	28.1			*0.7*	*2.7*
Spouse: Some College	28.6			*1.2*	*3.2*
Spouse: College Graduate	29.6			*2.2*	*4.2*

Notes. The sample includes men and women ages 25-84 at the time of their NHIS interview. Age in years was top coded at 100+ in the analyses in order to close the life tables. The analyses were further restricted to respondents who 1) were eligible for mortality follow-up in the NDI; 2) non-Hispanic white or non-Hispanic black; and 3) had complete information on the variables in the models. The interviews took place during the 1986-2004 NHIS survey years. Deaths occurred between the interview date (i.e., January 1986 - December 2004) and December 31st, 2006.

Table 4. Life Expectancy at Exact Age 55 for *Women* by Own Education, Spouses' Education, and Marital Status at Interview: NHIS-LMF, 1986-2006

	Life Expectancy at Age 55 (e_{55})			Married vs.	
	Married	Never Married	Previously Married	Never Married	Previously Married
< High School					
Overall	27.3	24.6	25.6	*2.7*	*1.7*
Spouse: < High School	26.9			*2.3*	*1.3*
Spouse: High School	27.8			*3.2*	*2.2*
Spouse: Some College	27.9			*3.3*	*2.3*
Spouse: College Graduate	29.7			*5.1*	*4.1*
High School					
Overall	29.9	26.7	27.2	*3.2*	*2.7*
Spouse: < High School	29.0			*2.3*	*1.8*
Spouse: High School	29.0			*2.3*	*1.8*
Spouse: Some College	30.0			*3.3*	*2.8*
Spouse: College Graduate	31.8			*5.1*	*4.6*
Some College					
Overall	30.9	28.6	28.3	*2.3*	*2.6*
Spouse: < High School	29.5			*0.9*	*1.2*
Spouse: High School	30.4			*1.8*	*2.1*
Spouse: Some College	30.6			*2.0*	*2.3*
Spouse: College Graduate	32.4			*3.8*	*4.1*
College Graduate					
Overall	33.6	32.2	29.8	*1.4*	*3.8*
Spouse: < High School	31.4			*-0.8*	*1.6*
Spouse: High School	32.3			*0.1*	*2.5*
Spouse: Some College	32.5			*0.3*	*2.7*
Spouse: College Graduate	34.4			*2.2*	*4.6*

Notes. The sample includes men and women ages 25-84 at the time of their NHIS interview. Age in years was top coded at 100+ in the analyses in order to close the life tables. The analyses were further restricted to respondents who 1) were eligible for mortality follow-up in the NDI; 2) non-Hispanic white or non-Hispanic black; and 3) had complete information on the variables in the models. The interviews took place during the 1986-2004 NHIS survey years. Deaths occurred between the interview date (i.e., January 1986 - December 2004) and December 31st, 2006.