Spousal Education and Mortality Among Older U.S. Adults

Dustin C. Brown

Mark D. Hayward

Robert A. Hummer

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ABSTRACT

Although the relationship between an individual's own education and mortality is firmly established, relatively few studies examine the consequences of a spouse's education for a person's own risk of death. Research from other nations generally documents a link between spousal education and mortality, but research from the U.S. is more ambiguous. We hypothesize that spousal education is associated with one's own risk of death because spouses pool material and non-material resources within a marriage in an effort to maximize their own and their partner's well-being. We also examine an alternative hypothesis put forth in several older U.S. studies that persons with lower levels of education relative to their spouse have an increased risk of death. Using data from the National Health Interview Survey Linked Mortality Files (NHIS-LMF), we estimate a series of Cox proportional hazards models to examine the link between spousal education and mortality among adults ages 50 and older in the United States. The results support our hypothesis that education is a household resource within the context of marriage. We find no support for the alternative hypothesis that educational discrepancies between spouses increase the risk of death. There is no evidence of gender differences in the association between spousal education and mortality. Models omitting information on spousal education among the married likely overestimate the importance of an individual's own education on his/her risk of death.

Education's association with a lengthy life stems from the array of resources that education provides (Mirowsky and Ross 2003). Like the educated, married persons also have a lower risk of death than the never-married, widowed, and divorced (Gove 1973; Ross, Mirowsky, and Goldsteen 1990; Waite 1995, 2000). Despite a great deal of evidence that an individual's education and that marriage are both inversely associated with mortality, relatively few studies examine the consequences of a spouse's education for a person's own risk of death (Jaffe, et al. 2005, 2006; Kravdal 2008). Recent research from other nations generally links spousal education to his/her partner's health and/or risk of death (Bosma, et al. 1995; Egeland, et al. 2002; Jaffe, et al. 2005, 2006; Kravdal 2008; Martikainen 1995; Monden, et al. 2003; Skaliká and Kunst 2008). These studies generally suggest that education is a pooled resource within a marriage and that failing to incorporate spousal education in models predicting health and/or mortality may overestimate the importance of an individual's own education. In contrast, studies – primarily from the United States – either report no link between spousal education and health/mortality after controlling for income (McDonough, Williams, House, and Duncan 1999; Stolzenberg 2001; Zick and Smith 1994) or that men married to women with higher levels of education relative to their own actually have an increased risk of deleterious health outcomes and/or death (Haynes, Eaker, and Feinleib 1983; Hornung and McCullough 1981; Suarez and Barrett-Connor 1984; see Vernon and Buffler 1988 for a review). However, the results of the studies linking spousal educational discrepancies to poorer health outcomes are questionable. The paucity of information concerning spousal characteristics and mortality, particularly in the United States, is surprising given the recent interest in how the social context shapes health. The household is the most immediate and salient context in which socioenvironmental factors affect an individual's

In this paper, we examine the link between spousal education and mortality in the United States. We address five interrelated questions to gauge how a spouse's education operates within marriage to

influence his/her partner's mortality risk. Is a spouse's education linked to one's own risk of death net of his/her own education? Does omitting information on spousal education overestimate the importance of an individual's own education on his/her risk of death? How are discrepant levels of education between spouses associated with each partner's mortality risks? Is education a household resource within the context of marriage as the research from other nations suggests, or do status discrepancies between spouses actually increase the risk of death for those with lower levels education as older studies from the U.S. argue? Finally, are there gender differences in any of these associations? We address these questions with a large, nationally representative sample of married men and women ages 50 and older drawn from the U.S. National Health Interview Survey Linked Mortality Files (NHIS-LMF).

BACKGROUND

The link between spousal education and mortality makes sense when one considers the dynamics of the marital relationship. Married persons share complex and deeply held social, emotional, legal, and economic ties with their partners. The intimate attachments that spouses share typically engender feelings of concern for each other's well-being. As a result, spouses inherently are motivated to pool their material and non-material resources in an attempt to improve their own and their partner's well-being (Jacobson 2000; Monden, et al. 2003; Skalická and Kunst 2008).[1] This is how the "family becomes a producer of health" (Jacobson 2000).

At the individual level, education plays a crucial role shaping a person's ability to access a variety of socioeconomic, social psychological and sociobehavioral resources instrumental in the promotion of mental and physical well-being (Ross and Mirowsky 2003; Ross and Wu 1995) and the resources gained via a spouse's education probably closely resemble those that a person acquires via his/her own education (Monden, et al. 2003). Moreover, the household is also the most immediate social context in which individuals are exposed to a variety of socio-

environmental health risks (Bartley, et al. 2003; Monden, et al. 2003; Ross, et al. 1990). Married couples often implicitly or explicitly recognize this fact and act to mitigate their own and their spouse's exposure to these risks by pooling resources. The material and non-material resources associated with education are an important resource that spouses pool. For these reasons, a spouse's education is likely to "matter" for a person's own risk of death (Monden, et al. 2003).

Although some U.S. studies report no association between spousal education and self-rated health (Stolzenberg 2001) and all-cause mortality (McDonough, et al. 1999; Zick and Smith 2004) after adjusting for each spouse's income, several prior studies using data from European population registers (Bosma, et al. 1995; Egeland, et al. 2002; Kravdal 2008; Martikainen 1995; Monden, et al. 2003; Skaliká and Kunst 2008), the Israeli Census prospectively linked to mortality records (Jaffe, et al. 2005, 2006), and a community-based epidemiologic sample from the U.S. (Strogatz, Siscovick, Weiss, and Rennert 1988) report an inverse association between spousal education and various health outcomes. These studies examine a wide range of outcomes including self-rated health (Monden, et al. 2003), smoking (Bosma, et al. 1995; Monden, et al. 2003) and other behavioral risk factors for coronary heart disease (Egeland, et al. 2002), myocardial infarction (Bosma, et al. 1995), primary cardiac arrest (Stogatz, et al. 1988), all-cause mortality (Bosma, et al. 1995; Jaffe, et al. 2005, 2006; Kravdal 2008; Skalická and Kunst 2008), cancer mortality (Jaffe, et al. 2005), and mortality stemming from various cardiovascular conditions (Bosma, et al. 1995; Egeland, et al. 2002; Jaffe, et al. 2005, 2006; Skalická and Kunst 2008). Although the majority of these studies examine health outcomes for men and women, a few only conduct analyses on men (Bosma, et al. 1995; Egeland, et al. 2002; Strogatz, et al. 1988).

A couple of studies report gender differences in the link between spousal education and mortality. Recent studies using Israeli Census data linked to subsequent mortality records found that spousal education did little to protect women from all-cause (Jaffe, et al. 2005) and CVD mortality (Jaffe, et al. 2005, 2006). Jaffe, et al. (2006) also found that for married men, a wife's education was a more robust predictor of CVD mortality than one's own education. A recent study by Skalická and Kunst (2008) reported an inverse association between spousal education and the risk of all-cause, CVD, and ischemic heart disease mortality net of own education, income, occupation, and age among Norwegian men, but this was not the case for Norwegian women. A variant of the household resource perspective explicitly argues that gender differentials will exist (Preston and Taubman 1994). The logic of this argument is that a woman's risk of death is more closely associated with her husband's education than her own education due to differential returns to education across the marital life course, although recent studies from the U.S. (Montez, Hayward, Brown, and Hummer 2009) and Scandinavia (Martikainen 1995; Monden, et al. 2003) suggest that this is not the case.

An alternative to the notion that education is a household resource within a marriage comes from the status inconsistency perspective. The status inconsistency perspective posits that status discrepancies between spouses that are inconsistent with broader social norms bring about role conflicts and the psycho-social stress triggered by these role conflicts usually is presumed to result in deleterious health outcomes and, ultimately, an increased risk of death (see Vernon & Buffler 1988 for a review of this literature). Notably, we define this process in gender neutral terms, but as originally conceived it only applied to lower status men married to higher status women. This perspective is supported in older studies from the United States. Men married to women with more education had elevated levels of stress (Hornung and McCullough 1981), a higher risk of heart disease (Haynes, et al. 1983; Suarez and Barrett-Connor 1984) and an increased risk of death (Suarez

and Barrett-Connor 1984). However, it is important to note that the samples used in the analyses tended to be very small, non-representative, and often only examined data for married men. Given these notable limitations and the evidence against status inconsistency effects in recent studies, it is unlikely that spousal educational discrepancies have adverse health consequences.

The purpose of this paper is to clarify the link between spousal education and mortality in the United States. In accordance with the view that education is a household resource, we hypothesize that the education of a spouse will add to the effect of one's own education, with higher levels of spousal education lowering one's own risk of death and lower levels of spousal education increasing a person's own risk of death. Additionally, because several older studies from the United States report that being married to a spouse with more education than one's own results in deleterious health outcomes, we also examine the effect of educational discrepancies (or inconsistencies) on the risk of death. Given the results of studies from other nations and the limitations inherent in the studies documenting a status inconsistency effect from the U.S., we do not expect to find support for the status inconsistency perspective. We also examine gender differences in the effect of spousal education on the risk of death.

DATA, MEASURES, AND METHODS

Data

The data in this analysis are from the public-use National Health Interview Survey Linked Mortality File (NHIS-LMF). The NHIS is a nationally representative cross-sectional survey of the U.S. non-institutionalized, civilian population. The NHIS has been conducted annually by the National Centers for Heath Statistics (NCHS) since 1957 and it contains approximately 100,000 respondents per year. The National Death Index (NDI) is a repository of U.S. death certificates begun in 1979. The NHIS-LMF contains data from the NHIS probabilistically linked to subsequent mortality in the NDI (see Lochner, Hummer, Bartee, Wheatcroft, and Cox 2008 for

an overview). The analyses in this paper use data from the 1986-1996 NHIS linked to mortality records in the NDI through December 31, 2002.

The analytic sample is restricted to currently married non-Hispanic whites and non-Hispanic blacks ages 50-84 at the time of the survey with complete information on the variables of interest. The sample is restricted to persons over the age of 50 in an effort minimize the potential for divorce between the date of interview and the end of the follow-up period. Older adults in the U.S. have a relatively low probability of transitioning out of marriage due to divorce (Schoen and Standish 2001; Uhlenberg, Cooney, and Boyd 1990). The upper limit on age at interview is imposed for purposes of data quality. In preliminary analyses (not shown), we found gender differences in the quality of the NDI matches among older NHIS respondents. However, restricting the analyses to respondents who were less than 85 years of age at interview circumvents this problem. The analyses are limited to non-Hispanic whites and non-Hispanic blacks also for purposes of data quality and as crude control for nativity status. Finally, the sample is restricted to currently married respondents indentified on the NHIS household roster as either the household reference person or the spouse of the household reference person. A disadvantage to this approach is that it excludes married couples not identified as the household reference person or his/her spouse (e.g., married couples residing in multiple family households). However, this is the most definitive way to link the characteristics of spouses in the NHIS-LMF. The final analytic sample contains 148,654 individual respondents and 41,636 deaths. Table 1 contains descriptive statistics for the sample.

Measures

All-cause mortality (1 = Dead, 0 = Alive) is the dependent variable and it is from the NDI. All the other variables used in the analyses are from the NHIS. Exposure to the risk of death is

measured in years and deaths are assumed to occur around mid-year on average. The independent variables are own education, spouse's education, the interaction of own and spousal education, age, and race. All of the models presented in the tables are stratified by gender. We use a categorical measure of education indicating a respondent's highest completed level of formal schooling. The four education categories are less than a high school, high school graduate, some college (no Bachelor's degree), and a four-year college degree (Bachelor's degree or higher). College graduates are the reference category in all of the models. Age at the time of the survey is measured in years and ranges from 50 to 84. Race is a dichotomous variable with 1 = non-Hispanic white and 0 = non-Hispanic black. All of the results are presented separately for men and women.

[Insert Table 1 here]

Methods

We estimate series of gender-specific Cox proportional hazards models to examine the association between own and spouse's education and the risk of death[2]. The models are as follows:

$$\ln h_m(t) = \alpha(t) + \beta_{m1} Own\ Educ + \beta_{m2} Age + \beta_{m3} Race \quad (1b)$$

$$\ln h_f(t) = \alpha(t) + \beta_{f1} Own\ Educ + \beta_{f2} Age + \beta_{f3} Race \quad (1b)$$

$$\ln h_m t) = \alpha(t) + \beta_{m1} Own\ Educ + \beta_{f2} Spouse\ Educ + \beta_{m3} Age + \beta_{m4} Race \quad (2a)$$

$$\ln h_f(t) = \alpha(t) + \beta_{f1} Own\ Educ + \beta_{m2} Spouse\ Educ + \beta_{f3} Age + \beta_{f4} Race \quad (2b)$$

$$\ln h_m(t) = \alpha(t) + \beta_{m1} Own\ Educ + \beta_{f2} Spouse\ Educ + \beta_{m,f3} Own\ Educ * Spouse\ Educ + \beta_{m4} Age + \beta_{m5} Race \quad (3a)$$

$$\ln h_f(t) = \alpha(t) + \beta_{f1} Own\ Educ + \beta_{m2} Spouse\ Educ + \beta_{f,m3} Own\ Educ * Spouse\ Educ + \beta_{f4} Age + \beta_{f5} Race \quad (3b)$$

The first set of models (Models 1a and 1b) examine the baseline association between own education and the risk of death net of the controls. These models are estimated to establish the basic association between a person's own education and his/her risk of death. The second set of models (Models 2a and 2b) examine the additive effects of one's own and one's spouse's education on the risk of death net of the controls. These models test the household resource perspective. If education is a pooled resource within the context of marriage, then a spouse's education should add to the effect of one's own education. Moreover, if omitting spousal education form the model overestimates the association between one's own education and the risk of death, the magnitude of the association between one's own education and the risk of death should be substantially reduced upon entering a term for spousal education into the model. The third set of models (Models 3a and 3b) examine the interactive effect of one's own and one's spouse's education on the risk of death net of the main effects of one's own and one's spouse's education and the controls. Models 3a and 3b test the status inconsistency perspective. If status discrepancies between spouses result in poorer health and an increased risk of death, then having educational configurations between spouses that are out-of-sync with prevailing social norms should increase one's risk of death.

Stata version 10 was used to analyze the data. The analyses incorporate sample weights and adjust for the complexity of the sampling design using Stata's *svy* commands. We present three measures of model fit, the -2 log likelihood, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC). However, following the recommendations of Raftery (1995), we rely on the BIC to assess how well the models nested with gender fit the data. Lower BIC values indicate that the current model fits the data better than the previous model.

RESULTS

Descriptive Statistics

Table 1 displays the descriptive statistics for the sample. There notable gender differences in the distribution of education. A larger proportion of men (30.6%) than women (24.6%) did not compete high school, whereas substantially more women (46.8%) than men (34.5%) had a high school diploma or its equivalent. Slightly more men (14.0%) than women (15.8%) had some college education. However, almost twice as many men (20.9%) in the sample had a college degree or higher compared to women (12.9%). As expected given the tendency to assortatively mate on education (Schwartz and Mare 2005), most of the couples were educationally homogamous. The majority of the persons in couples that were not educationally homogamous had levels of education that were either one level higher or lower than their spouse. Very few couples (e.g., less than one percent) consisted of persons with very low levels of education married to persons with high levels of education[3]. Finally, again as expected, women were about two years younger on average than the men in the sample and most of the respondents were under 70 years of age at the time of interview.

[Insert Table 2 here]

Proportional Hazards Models

Table 2 contains the results of the Cox proportional hazards models displayed as hazard ratios. Models 1a-3a show the results for married men and models 1b-3b show the results for married women. Although the hazard ratios for men are slightly higher than those for women in most of the models, none of the results differ significantly by gender (see footnote 2). As expected, the models examining the baseline association between one's own education and the risk of death (e.g., Models 1a and 1b) show a marked educational gradient. Married men who did not complete high school have a 64% higher risk of death than married men with a college degree, whereas the risk of death for married women without a high school diploma is almost 60% higher than it is for women who have a college education. Men and women in the baseline models with a high school diploma have a risk of death that is about 36% and 30% higher, respectively, than married persons with a college education. The risk of death is 25% higher for married men and 20% higher for married women with some college education compared to the college educated married persons. These results underscore the important role played by one's own education in reducing the risk of death.

The second set of models in Table 2 examine the additive effects of own and spousal education among married men (2a) and women (2b) respectively. Once again, these models test the notion that education is a household resource. As indicated by the BIC, Models 2a and 2b fit the data significantly better than Models 1a and 1b. Two important findings emerge from models 2a and 2b. First, as expected, a spouse's education is linked to a person's own risk of death net of his/her own education. A person's own education still remains a more robust predictor of his/her own risk of death than his/her spouse's education, especially among men (although the interaction for gender is not significant). However, all levels of spousal education are significantly related to his/her partner's risk of death and the gradients are all in the direction

predicted by the household resource perspective. Men married to women without a college degree have approximately a 24% to 7% greater risk of death compared to men whose spouse has a college degree. Women married to men who do not have a college degree have around a 25% to 16% higher risk death than women married to college educated men. These results suggest that education is a pooled resource with a marriage. Although the results of Model 2a and 2b are contrary to other studies based on U.S. data, they are consistent with recent studies using data from other nations. The second important point made by Models 2a and 2b is that including spousal education in these models reduced the effect of one's own education on the risk of death, especially at lower levels of own education. The hazard ratios for own education among men decreased roughly 10% to 4% between Models 1a and 2a and around 13% to 5% for women between Models 1b and 2b (as an example, the percent change in the hazard ratio for men without a high school diploma was calculated as follows [(1.472-1.635) ÷ 1.635]*100 = -9.96). Thus, these results imply that models examining educational differentials in the risk of death among married people somewhat overestimate the association between one's own education and mortality when they do not incorporate information on spousal education.

The third, and final, set of models (3a and 3b) displayed in Table 2 contain a series of multiplicative interaction terms for own*spouse's education. These models test the assertion made in older studies from the U.S. that people in educationally hyperogamous couples have a higher risk of death than persons whose spouse has the same or a lower level education than their own level of education. The results from Models 3a and 3b do not support the idea that status inconsistency increases the risk of death. First, the BIC for Models 3a and 3b are substantially higher than the BIC in all previous models. This indicates that the interaction terms introduced in Models 3a and 3b result in a significant reduction the fit of the models. Second, only one of the

interaction terms in Model 3a (i.e., high school x high school education) attains statistical significance at the $p \leq 0.05$ level and none of the interaction terms in Model 3b are statistically significant. As expected, the results from Table 2 lead us to reject the notion that status inconsistency increases and person's risk of death. In sum, we conclude that a spouse's education is associated with a person's own risk of death and that education is a household resource within the context of marriage.

DISCUSSION

In this paper, we examined the association between spousal education and all-cause mortality among older married men and women in the United States using data from NHIS-LMF. We hypothesized that spousal education would be associated with one's own risk of death because spouse's pool material and non-material resources within a marriage in an effort to maximize their own and their partner's well-being. Through this process an individual's education becomes a pooled, or household, resource among the married. If this is the case, then own and spousal education should have an additive effect on the risk of death. We also tested an alternative hypothesis put forth in several older U.S. studies that persons with lower levels of education relative to their spouse would have an increased risk of death in situations where intra-spousal educational discrepancies are in violation of broader sociocultural norms. Although we frame the status inconsistency hypothesis in gender neutral terms, older studies from the U.S. only report that status inconsistencies increase the risk of poor health outcomes among men married to women with higher relative levels of education (Haynes, et al. 1983; Suarez and Barrett-Connor 1984; also see Vernon and Buffler 1988). If the status inconsistency hypothesis is correct, own and spousal education should interact in a manner consistent with the predictions of the theory to influence the risk of death. As expected, we found clear evidence to suggest that a spouse's

education is associated with one's own mortality risk in a manner consistent with the notion that education is a household resource. Although this finding is contrary to some relatively recent studies in the United States (McDonough, et al. 1999; Stolzenberg 2001; Zick and Smith 1994), it is broadly consistent with several recent studies from other nations (Bosma, et al. 1995; Egeland, et al. 2002; Jaffe, et al. 2005, 2006; Kravdal 2008; Martikainen 1995; Monden, et al. 2003; Skaliká and Kunst 2008). Also, as expected, we found absolutely no evidence for the notion that status inconsistency increases the risk of death. This is also consistent with recent research from other nations. However, it contradicts the findings of several older, non-representative studies from the United States (Haynes, et al. 1983; Hornung, et al. 1981; Suarez and Barrett-Connor 1984; also see Vernon and Buffler 1988 for a review). Finally, we found no evidence that any of our results differed according to gender. Our findings suggest that education is a household resource within a marriage that operates to reduce the risk of death among married men and women in similar ways.

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 presents several important drawbacks in our analyses. We cannot detect marital status transitions. Although the probability of divorce is relatively low at ages 50+, the probability of becoming a widow increases precipitously, especially for women. This, however, may be mitigated somewhat by a recent Scandinavian study that found that the education of a former spouse still influences a person's 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, mortality selection may present a problem in analyses of marriage and mortality. All of the people were currently married when interviewed. Thus, this is a relatively advantaged

population. Third, assortative mating is occurring and inevitably influencing our results. However, we have no way of dealing with this problem in the NHIS-LMF. Future analyses using panel data should delve into this issue and attempt to correct the estimates accordingly. Third, the models do not contain data on income and/or wealth. This is important because recent U.S. studies include income. They find that spousal education no longer matters after including personal income. This deserves further attention. Fourth, these analyses are only for all-cause mortality. Given the differences uncovered in recent research by cause of death (e.g., Jaffe, et al. 2005, 2006), the paper should analyze cause-specific mortality. Finally, the models do not adjust for the non-independence between spouses. This is an important point. Adjusting for the interdependence between spouses would allow researchers to test hypotheses concerning spousal effects more rigorously.

Our results strongly suggest that education is a household resource within the confines of marriage. More importantly, our findings also clearly imply that failing to include spousal education in models that examine the link between education and mortality among the married probably results in an overestimation of the importance of one's own education, especially at lower levels of education. Thus, the analyses presented herein suggest that researchers should seriously contemplate including measures of spousal education in models examining educational differences in mortality.

Note: For presentation at PAA, we plan to modify our analyses as follows:

- We will experiment with including income in our models. We plan to use a regression-based approach for imputing missing values for income, but will investigate alternative approaches (e.g., listwise deletion, etc.) before making a final decision. In contrast to other U.S. studies, we will measure income at the household (e.g., household income

categories, income to needs ratios, etc.), rather than the individual level (e.g., personal earnings for each spouse).

- We also intend to include analyses of cause-specific mortality. The causes of death to be analyzed are as follows (note: these are subject to change): diseases of the heart, cerebrovascular disease, cancer (excluding lung and breast cancer), lung cancer, breast cancer (women only), chronic lower respiratory diseases, diabetes mellitus, and external causes (e.g., accidents, suicide, and homicide). These are all leading causes of death in the United States. Analyses of these specific causes of death will allow us to compare our results with prior studies from other nations. Moreover, the fact that these causes of death largely have behavioral origins these analyses will allow us to examine the possibility that spousal education influences one's own risk of death, at least in part, via health behaviors (e.g., smoking, diet, physical activity, etc.).
- We will also examine alternative modeling strategies. Specifically, we plan to estimate a shared frailty models. This will allow us to account for unobserved heterogeneity (due to joint preferences/experiences concerning health behaviors, assortative mating, etc.) between spouses. Shared frailty models are the survival analysis analog to fixed-effects models. Shared frailty models are relatively easy to estimate in Stata (see Gutierrez 2002 for an overview), but will require us to estimate parametric hazard models. Thus, we will conduct exploratory analyses to determine the most appropriate functional form for these models. Estimating shared frailty models will help make our analyses one of the most rigorous tests of the association between spousal education and mortality to date.

- Finally, we will calculate follow-up time in quarter years (e.g., the most detailed metric of follow-up time available in the NHIS-LMF), not years. This will increase the precision of our estimates.

Table 1: Descriptive statistics for married men and women ages 50 and over, NHIS-LMF, 1986-2002

	Married Men (N = 74,327)		Married Women (N = 74,327)	
	n	%	n	%
Own Education				
Less than high school	23,481	30.6	18,790	24.6
High school	25,565	34.5	34,591	46.8
Some college	10,229	14.0	11,546	15.8
College	15,052	20.9	9,400	12.9
Own X Spouse's Education				
< High school X < High School	13,035	16.9	13,035	16.9
< High school X High school	8,707	11.4	4,413	5.9
< High school X Some college	1,293	1.7	951	1.3
< High school X College	446	0.6	391	0.5
High school X < High School	4,413	5.9	8,707	11.4
High school X High school	16,670	22.6	16,670	22.6
High school X Some college	3,166	4.2	4,957	6.8
High school X College	1,316	1.8	4,257	6.0
Some college X < High School	951	1.3	1,293	1.7
Some college X High school	4,957	6.8	3,166	4.2
Some college X Some college	3,028	4.2	3,028	4.2
Some college X College	1,293	1.7	4,059	5.7
College X < High School	391	0.5	446	0.6
College X High school	4,257	5.9	1,316	1.8
College X Some college	4,059	5.7	1,293	1.7
College X College	6,345	8.8	6,345	8.8
Age at interview				
50-59	22,167	30.0	31,273	42.3
60-69	29,509	39.7	27,618	37.0
70-79	18,999	25.4	13,906	18.6
80-84	3,652	4.9	1,530	2.1
Mean	64.9		62.2	
Race-ethnicity				
Non-Hispanic white	67,589	93.0	67,616	93.5
Non-Hispanic black	6,738	7.0	6,711	6.5
Deaths	26,648	35.4	14,988	19.9

Note: The frequencies are unweighted and the means and percentages are weighted.

Table 2: Risk of death (hazard ratios) by own education, spouse's education, and own education X spouse's education for married men and women ages 50 and over, NHIS-LMF, 1986-2002

	Married Men			Married Women		
	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Own Education						
Less than high school	1.635***	1.472***	1.483***	1.597***	1.394***	1.320*
High school	1.357***	1.272***	1.411***	1.301***	1.197***	1.209***
Some college	1.251***	1.203***	1.230***	1.206***	1.149***	1.137*
Spouse's Education						
Less than high school		1.238***	1.393***		1.252***	1.258*
High school		1.137***	1.167***		1.127***	1.109
Some college		1.077*	1.116**		1.163***	1.164*
Own X Spouse's Education						
< High school X < High School			0.885			1.029
< High school X High school			1.033			1.129
< High school X Some college			0.910			1.132
High school X < High School			0.861			1.020
High school X High school			0.877*			0.982
High school X Some college			0.882†			0.974
Some college X < High School			0.945			0.992
Some college X High school			0.947			1.054
Some college X Some college			0.988			0.996
Age	1.090***	1.090***	1.090***	1.090***	1.090***	1.090***
Non-Hispanic black	1.135***	1.129***	1.132***	1.154***	1.151***	1.157***
-2*Log Likelihood	-277,062.8	-277,025.7	-277,011.8	-155,849.9	-155,819.8	-155,814.5
AIC	554,135.6	554,067.4	554,057.7	311,709.8	311,655.5	311,662.9
BIC	554,181.7	554,141.2	554,214.3	311,755.9	311,729.3	311,819.6
Degrees of freedom	5	8	17	5	8	17
N	74,327	74,327	74,327	74,327	74,327	74,327

Notes: Two-tailed tests: $^{\dagger}p \leq 0.10$, * $p \leq 0.05$, **$p \leq 0.01$, *** $p \leq 0.001$. Reference categories: college, non-Hispanic white

APPENDIX

Table A1: Distribution of own and spouse's education among deceased men, NHIS-LMF, 1986-2002

Own Education	Spouse's Education: Less than high school	High school	Some college	College	Total
Less than high school	6,677	3,856	545	193	11,271
High school	1,781	5,289	1,013	435	8,518
Some college	382	1,522	908	380	3,192
College	139	1,160	1,020	1,348	3,667
Total	8,979	11,827	3,486	2,356	26,648

Table A2: Distribution of own and spouse's education among deceased women, NHIS-LMF, 1986-2002

Own Education	Spouse's Education: Less than high school	High school	Some college	College	Total
Less than high school	3,970	1,084	253	86	5,393
High school	1,991	2,800	872	678	6,341
Some college	308	561	513	580	1,962
College	104	206	207	775	1,292
Total	6,373	4,651	1,845	2,119	14,988

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ENDNOTES

[1] Becker (1991) argues that resource pooling occurs because of altruism within the family (this is usually referred to as the "common preferences" assumption). Jacobson (2000) also makes this assumption, but points-out that family members do not always necessarily behave altruistically. Prior research does indicate that resources (i.e., income) within the household are distributed differentially when women rather than men are in control of their disbursement (Lundberg and Pollak 1996). This is taken to suggest that the common preferences assumption does not hold. However, in the vast majority of (non-abusive) relationships, it is unlikely that either spouse would allocate resources with enough inequity to increase his or her partner's risk of death appreciably. Thus, as Jacobson (2000) implies, gender differences in resource allocation within the family exist, but this will have a negligible effect on the health of family members.

[2] We also estimated a series of pooled models with interactions for gender*own education, gender*spousal education, and gender*own education*spouse's education (not shown). The models included all main effects, lower-order interaction terms, and controls for race and age. These models indicated that the results do not differ significantly by gender (i.e., the interactions were not significant). These results are similar to those recently reported by Montez, et al. (2009).

[3] This raised concerns that some of the cells in the models interacting own and spousal education would be sparsely populated. Tables A1 and A2 in the Appendix indicate that, with a few important exceptions, this is generally not the case. Nonetheless, the results for very low – very high spousal educational configurations should be interpreted cautiously, especially among women.