

## **Chapter Three**

### **Interpreting the Effects of Spousal Loss on Mortality**

Having now completed a substantial number of analyses, this chapter seeks to assess and summarize the results. First, we will look back at the previous work highlighted in the first chapter. Then I will make some more general comments on the magnitudes of the effects, and nature of the marital mortality benefit.

#### **3.1 Assessing Past Work**

At the end of the first chapter, I introduced a table summarizing the implications of each of the many theories discussed. Now, going back through the regressions of the previous chapter, I can populate that table, assessing the degree of support. This is done in Table 3.1. Since the regressions were run separately for men and women, and it is conceivable that men and women could act through different processes, I tabulate the amount of support each theory received by each gender.

##### **3.1.1 Work Contradicted**

A number of predictions of past work were directly and clearly contradicted by the current analyses. Before reviewing this, a general and important reservation needs to be noted. The analyses presented here have examined only one outcome – death – and have not included the myriad other measures of health such as morbidity, physical functioning, self-rated health, or mental health. Differing patterns could, of

course, be found with different outcomes. Likewise, I have looked only at the impact of loss of a spouse among the heterosexually-partnered elderly. Other marital status transitions at other times in the life course might well lead to other patterns. That being said, none of the theories outlined prospectively predicts such differences; it is quite likely that they can be reformulated to make more nuanced predictions – but that elaboration remains in the future. Finally, this work can not speak to whether or not the changes in hypothesized intervening mechanisms do in fact occur with marital status transitions – indeed, many of the changes in intervening mechanisms do seem to occur. This work can only suggest that those differences in intervening variables often do not appear to be consequential for mortality in any substantial way. (That is, this work cannot evaluate whether or not the immune system functions differently after widowhood; this work can only argue that any differences in immune system functioning do not appear to account for differences in mortality.)

There was evidence that the reduced physiologic functioning associated with the loss of a spouse does not account for important mortality differences with marital status transitions. (Hypothesis A in Table 3.1) Likewise there was evidence to contradict each of the following:

- that marriage acts by providing emotional benefits that buffer stresses (Hypothesis B2);
- that marriage acts by providing direct day-to-day support of physical needs (Hypothesis D2);

- that marriage acts by augmenting health capital that inheres in the proband him/herself. (Hypotheses F1, F2, and F3); and,
- that continuity of assets alleviates the bereavement effect in women (Hypothesis G).

Furthermore, I find little evidence that the impact of marital mortality is actually an artifact driven by selection. There is no evidence to support the importance of positive assortative mating. (Hypothesis S1) There is little evidence to support a sufficiently close correlation in time of the onset of illness between a husband and wife to explain the impact on mortality. (Hypothesis S2) I find evidence that there are not joint health shocks of sufficient magnitude nor sufficient joint poor health behaviors to account for the impact of marital status transitions. (Hypothesis S4) I find evidence that caregiver fatigue is not quantitatively important in explaining correlations in mortality. (Hypothesis H1)

### **3.1.2 Work Receiving Partial Support**

The social support literature received some degree of support. In particular, the rankings proposed by Litwak *et al.* in their paper – hypothesis D1 – were born out to a degree. (Litwak et al. 1989) They interpret this as meaning that marriage, as an example of a “primary group” is most effective at providing flexible, responsive support, particularly along lines “involving minimal technical knowledge, particularly when those tasks cannot be continuously monitored” (page 52). However, they then provide an example: “e.g., caring for the bedridden patient,” (page 52) for which our

data suggest that marriage *does not* provide a particular mortality advantage. It seems that their emphasis on the flexibility of the primary group is particularly important, and separable from a certain medical naiveté that limits the value of certain of their examples.

Likewise, the model of spousal help as a form of social capital received a degree of support. For men, it was clearly worse to lose a spouse suffering from cancer than from one suffering from C.H.F., a hip fracture, or a stroke. This suggests that men benefit from the physical functioning of their spouse – still relatively intact in the cancer patient, but already lost in the other spouses. (Hypothesis E1) Among women, the absence of such effects suggests that men's physical functioning is less important to the benefits they may provide.

The work on marital status as social control, rooted in Umberson's seminal articles, which made the most detailed predictions, received quite mixed support. (Hypothesis C) It correctly predicted the individuals with C.H.F. should suffer more from the loss of a spouse than should individuals with cancer. The prediction was based on the fact that C.H.F. is more responsive to day-to-day care; particularly important to the health of a patient with C.H.F. is rigorous compliance with his or her medications and dietary restrictions. Cancer patients face no parallel constraints so open to policing. The suggestion that the effects of spousal loss should be greater for men than for women received support. More generally, however, the time course suggested by the social control theory received little support. If non-normative habits take some time to acquire, and as their effects are assuredly somewhat delayed in

onset, then in general the relative hazard of death of widows and widowers should be increasing after the loss of their spouse. To return to a concrete example: suppose the widowed begin to smoke. While this may slightly increase the immediate hazard of death, smoking takes time to damage the lungs enough to increase respiratory tract infections and otherwise increase the hazard of death. Thus the normative policing hypothesis would argue that the relative hazard of death should consistently rise – rather than fall – following the death of a spouse as progressive *mal*-adaptation occurs. This was not found to be so. Thus while Umberson’s theory may be quite useful in understanding the short-term bereavement behavior, it seems less valuable in explaining longer-term differences in mortality.

### **3.1.3 Work Supported**

That marriage acts by providing information – hypothesis D3 – received clear support. Of the diseases studied, the treatment of myocardial infarction was advancing far more during the mid-1990s than the other conditions under study here. (Centers for Disease Control and Prevention 1999; McClellan and Noguchi 1998) Disparities in quality of treatment provided across institutions is quite well-documented. (Krumholz et al. 1998) Moreover, the advances occurred not merely in the initial treatment provided for M.I. (*e.g.* catheterization and thrombolytics), but also in the follow-up care provided (*e.g.* use of aspirin and  $\beta$ -blockers).

### **3.1.4 Work for Which Tests were Inconclusive**

Regrettably, some hypotheses could not be adequately tested in our data. These were hypotheses that hoped to exploit differences in a relatively rare outcome as a function of a relatively rare condition – even in the large COSI data set, the multiplication of two small probabilities led to too few cases to analyze. New extractions from the claims, perhaps using targeted case-control methods, may be more fruitful in examining these. These hypotheses were:

- that marriage works through the emotional benefits of perceived support (Hypothesis B1);
- that kin-keeping is important to marital mortality effects (Hypothesis D4);
- the social capital on intellectual functioning mode (Hypothesis E2); and,
- selection assessed via “exogenous” spousal loss of cardiac arrest (Hypothesis S3).

## **3.2 Tentative Summary**

The review here suggests caution in using intermediate outcomes to study the impact of complicated social processes. This note of caution has been sounded before, in the study of everything from randomized controlled trials (Buyse and Molenberghs 1998; Justice 1996) to the impact of household income on childhood outcomes. (Mayer 1997)

More generally, these results should not be that surprising. Whatever else it may be, the household is clearly also a locus of production. Families make things.

When one half of any team leaves, many, many things about that team will change. So it is with a household upon spousal loss – it is not surprising that so many differences in possible intervening variables have been found. What is equally clear, however, is that not all differences in behavior have implications for health – most differences probably do not have any substantial implications within the realm of the variation observed in the general population. At risk of belaboring the point, consider one concrete example. The evidence is rather convincing that married people have much more sex than the unmarried. (Waite and Joyner 2001) Sex is assuredly a type of cardiovascular exercise, and so is – to some degree – protective against cardiovascular disease. But it is also clear that the total differences in cardiovascular exercise for which differences in intercourse *per se* account simply cannot be responsible for the differences in mortality between the married and the unmarried. If, however, one only measures the impact of marital status transitions on the behavior hypothesized to be important, one can find tentative support that rather misses the point.

This is meant only as a caution, however, not as a condemnation of entire lines of research. It is extraordinarily unlikely that in the foreseeable future I will have data sets with both sufficient behavioral detail to be able to support fine-grained studies of possible intervening variables but that also have sufficient numbers of cases to allow the study of the impact of unusual events (marital status transitions) on hard-to-measure outcomes (either because they are rare (mortality) or fuzzy (“health”)). In

the meantime, as every one knows, triangulation and a degree of circumspection are necessary.

### **3.3 Some Comments on Magnitude**

Having examined the data in light of various explanatory frameworks, let us step back a moment and look at the absolute magnitude of the effects examined here. There have been relatively few longitudinal studies of the effects of marital status on mortality; most data has been derived from cross-sectional studies that have methodologic problems. Direct comparisons of the magnitude of the effects across studies is difficult because of differences in parameterization, but important for our interpretive goals.

Important early work in the Panel Study of Income Dynamics (PSID) showed that the loss of a spouse to death was associated with a difference in the hazard ratio equivalent to 10 years of age (among the elderly) for men, but very little difference for women. (Lillard and Waite 1995) This work did not explore a transient component to the loss. Among the elderly, work using the LSOA noted the absence of an effect of marital status per se following empanelment on an arbitrary date. (Korenman, Goldman and Fu 1997) When looking at marriage in a time-varying context, they showed that widowed men had a 34% greater hazard of death for the first year of their bereavement, which declined to a statistically insignificant 8% thereafter. Women showed a similar pattern, with a 28% increase in the hazard of death for the first year, declining to 15% thereafter; no age controls were provided to

allow standardization, but these hazard ratios are quite similar to those observed in my analyses. The Cardiovascular Health Study of almost 6,000 elderly men and women found no association between baseline marital status and five-year mortality once detailed health controls had been implemented. (Fried et al. 1998)

Two studies have looked within disease categories comparable to those reported here. In a study with substantial medical controls, Lisa Berkman and her colleagues showed that very low levels of social support were prospectively associated with an increase in 6 month mortality equivalent to 10 years of age among elderly myocardial infarction victims; they did not estimate separate equations for men and women. (Berkman, Leo-Summer and Horwitz 1992) These results, however, compared those with no sources of emotional support (27% of the sample) to those with at least 1. Among those without comorbidities, those patients who had at least 2 sources of support had improved mortality relative to those with only 1 source; among those with some degree of comorbidity burden, there was no difference in mortality between those who had 1 source of support and those who had multiple sources. Thus it is possible that the Berkman *et al.*'s results are driven by their focus on a healthier population than the COSI data, and by focusing on a more isolated group than those who are merely widowed. The second study utilized the Surveillance, Epidemiology, and End-Results (SEER) cancer registry from New Mexico from 1969-1982. (Goodwin et al. 1987) Goodwin and colleagues showed that marital status at diagnosis is associated with improved mortality for 5 of 13 types of tumors. They reported that there were no significant gender differences, and in

general found that divorced individuals were at greater risk than married individuals. They found significant advantages of marital status in the case of colon cancer and lung cancer, but not urinary tract cancers. (The “bad cancer” aggregate cannot be directly compared to the results they tabulate.) Inspection of their figures suggests that the differences associated with marital status strongly decline with age, becoming insignificant among the elderly, particularly elderly women – or, quite similar to the results my analyses.

In summary, then, the marital mortality effect among COSI cohort members appears to be significantly smaller than that observed in the PSID or in Berkman's study of elderly MI survivors. Its magnitude is similar to that observed in the LSOA and SEER, and likewise consistent with Manton's findings that marital status differences are associated with only very small differences in life expectancy among those already with some degree of disability. (Manton, Stallard and Woodbury 1992) And this magnitude is worth some emphasis: it is small – although not trivial. Differences in mortality equivalent to being a couple of years older are not as large as those that were expected based on the work in middle ages. But among the healthy elderly, those difference may amount to an expectation of life of perhaps a year or two difference – in 1999, a 75 year-old man could look forward to 9.8 years of additional life on average, whereas his 70 year-old counterpart could look forward to 12.6 more years of life. (The difference was 0.6 years greater for women.) (U.S. Census Bureau 1999) A number of lines of evidence suggest that there may be an important age-gradient in the marital status effects, particularly the difference

between the PSID's predominantly middle-aged subjects and the LSOAs elderly, and the pattern found in the SEER data. This may be interpreted within a life-course framework, as others have done. (Williams 2001) However, as most people experience most of their health problems in the elderly years, if marital status is really important in reducing physical illness in advanced societies, it has to function among the elderly. Otherwise, from a health perspective, marriage is primarily important in preventing a rather rare event.

Are there reasons why the true importance of marriage might be misrepresented in these data?<sup>1</sup> First of all, it is possible that marriage might be associated with decreased morbidity after the onset of these serious diseases—and thus of considerable policy and clinical interest—despite the absence of much of an effect on mortality. Second, it is possible that marriage might have a substantial effect on mortality by delaying the onset of disease, but is less efficacious in extending life once a disease has struck. Third, it is possible that the health care system serves to replace some of the functions of a spouse among those who are ill. I can speculate to a degree on each of these effects.

May marriage reduce the morbidity burden associated with serious disease? Frankly, the data simply do not exist to assess this. There is an embarrassing lack of work on the impact of social factors on functioning after diagnosis. (c.f., (Given et al.

---

<sup>1</sup> It is possible that the effects of marriage have been overestimated (or over-interpreted) as a result of misspecification of the time-course of the hazard of death following bereavement, particularly a problem in samples with few years of follow-up. However, the relatively flat hazard of death experienced by spouses following the loss of a proband suggests this is not a problem.

2000; Ickovics, Viscoli and Horwitz 1997) and the references therein.) Much of the clinical literature on functioning lack standardization in design, despite notable advances such as the activities of daily living scales. (Institute of Medicine 1991; Nagi 1976) And, much of the information on illness trajectories after diagnosis that was located had to be extracted from the standard treatment arm of randomized controlled trials. Since RCTs intentionally enroll an unrepresentative sample – typically younger and healthier than the general population at risk for a disease – the functioning information we extract from standardized treatment arms is unlikely to be fully generalizable. In contrast, the gerontological literature has an enormous number of studies of activities of daily living, but often inadequate health measures or irregular social measures – clearly, there needs to be greater integration.

There is a broader set of questions here, as well. Although most measures of disability tap relatively basic dimensions, they are not fully primitive. As such, they involve a behavioral component that needs to be remembered. To be concrete, consider the act of “able to bathe oneself”. It clearly means one thing if I am unable to bathe myself and my wife is there to bathe me each morning. It means something different if I am unable to bathe myself and receive the services of a visiting nurse every other day. If social factors influence not merely the process by which physical problems that underlie disabilities *are acquired*, but also the cost of “expressing” disability given a set of physical attributes, then there are serious methodological and theoretical problems that need to be solved here. There is some evidence that this might be important. Using the AHEAD data, Smith and Kington found that given an

extensive set of comorbidity measures, marital status was associated with *decreased* physical functioning. (Smith and Kington 1997) While other explanations for this exist (*e.g.*, marriage helps keep more physically marginal people alive), clearly some hard thinking is warranted here.

May marriage act to reduce the onset of serious disease? This seems quite plausible. Manton *et al.* found that the a 75 year old married man with no impairment had a life expectancy of 9.71 years vs, 6.98 for an unmarried man; in contrast those numbers are 0.330 and 0.283 among those with a degree of cognitive impairment. (Manton, Stallard and Woodbury 1992) The increased hazard of widowhood persisted among the healthy spouses of COSI members, but not in COSI members themselves – with the notable exception of those with myocardial infarction. That is, the healthier one is, the *more* dependent on one's spouse one is. The hard question that remains is: how does this happen? I have found evidence that suggests it is *not primarily* through some sort of direct physiologic benefit, nor through the simple policing of non-normative behaviors.

Marriage may well be more important for these processes earlier in life than during the elderly years. After all, there has been a decoupling of marital status from many of potential intervening variables among the elderly: income (as Social Security replaces labor market income), health care access (as Medicare replaces employer-provided health insurance), and many kinds of stress (via exit from the labor market and the normative expectation of work for men). If this is true, the cumulative effects of marriage could be quite important, but the impact of the exit from marriage into

this more buffered regime would be blunted. If this is true, cross-national longitudinal studies would be quite interesting, as would be studies that exploited the natural experiments of any Social Security or Medicare reform.

More generally, it may be more useful to think of a spouse as a sort of all-purpose problem-solver (or, for those so-inclined, a form of general capital). To this line of thinking, spouses are most useful when there are many degrees of complexity. After diagnosis, the complexity is greatly reduced – there is a dominant disease with its own time course. Suddenly the general capital of a spouse is no longer so useful—instead the specific knowledge of the medical care system and of others with that disease are of primary importance. This approach is particularly appealing if one thinks about the way “health” is actually produced on the ground. While it is assuredly useful to think simply about “investments in health capital”, what would such an investment actually look like? How would you personally go do that? Short of a six-week bootcamp investment in physical conditioning, direct investment in health seems difficult for an adult living in the developed world. Instead, I would contend, most health is “produced” jointly, as the intended (or not) co-product with some other household product which is desired in the short-term. If there are complementarities within couples, the married increase the overall production of a household relative to the two in single households. Thus, the amount of health, produced as a byproduct of the other productivity, rises as well. How, then, do spouses increase household productivity?

There is some evidence to suggest that women's ways of being useful include more of a physical component than do men's. This could mean many things. It could mean that housework and the day-to-day provision of direct services is important. (This coincides with a stereotype of the wife nursing the husband.) But it could also be the wife's mobility is quite important for any number of other reasons. For example, wives' social networks – the ones that they tap for information – may be more based on interactions in the social sphere that require face-to-face contact, whereas those of husbands were derived from business and so use telephone contact more easily. This is only speculation, but is also meant as warning against too quickly jumping to any fine-grained conclusions about the particular tasks that spouses do that makes them useful.

This broad line of argument—spouse as general capital—has testable implications. First of all, is it true that the complexity of an individual's health is reduced after the onset of diseases for which there is a lower marital mortality benefit? One way to assess this would be to follow an incidence cohort forward and examine the variation in cause of death; this line of argument would predict that patients who have had a heart attack would go on to die of greater range of diseases than would those with lung cancer. The second implication is that it should be very hard to find intervening variables that account for a spouse's actions, since those actions will vary so much. A sports analogy may be helpful. Consider the Chicago Bulls of the late 1990's. To one view, the spouse is a role player, like Steve Kerr, consistently providing three-point shots. To figure out how important Steve Kerr was

to a victory on a given night, you just looked at his 3-point shot total. Alternatively there was Scottie Pippen. Some nights he shot beautifully. Other nights he was wandering around playing phenomenal defense, but rarely scoring. There was no single indicator that could be checked to indicate his usefulness – but it was almost always better to have him on the court than not.

Furthermore, spouses should be associated with a wide-variety of health behavior differences, although those health behaviors may not be particularly independently important. Instead, in a world of very imperfect information on what actually improves health, spouses are helpful on many axes because there is no particular axis on which they can focus. Thus there should be quite general differences between the health care utilization patterns of the married and the unmarried, a possibility to which I will turn in the next chapter. In light of the patterns of impact of marital status on health care utilization, I will return to the question of how the actions of spouses can be understood in the final chapter.

Most broadly, this work suggests the importance of taking into account the dynamics of adaptation when contemplating the impact of social structures on health. If social structures broadly provide productive resources, (Coleman 1988) substitutes may generally be possible. But it may be possible to design systems that serve to facilitate those transitions and hurry along the process of finding substitutes.

Table 3.1: Summary of Hypotheses

Theory	Focus	Disease Ranking	Male Support	Female Support
<b>Current Period Models</b>				
A Direct Physiology	Proband	Cancer > CHF, stroke, hip > MI	No	No
B1 Emotional – Stress Buffering	Proband	CHF, stroke, hip > MI	No	No
B2 Emotional – Perceived Support	Proband	Non-Alz. > Alz. CHF > MI, Cancer	Incon- clusive	Incon- clusive
C Social Control (Umberson)	Proband	Time Course: up, and increasing thereafter	<b>Partial</b>	<b>Partial</b>
Social Support – D1 Informal Groups (Litwak)	Proband	Stroke, hip > colon, lung > MI, CHF > CNS, pancreatic cancer	<b>Partial</b>	<b>Partial</b>
Social Support – D2 Day to Day Care	Proband	CHF, hip, stroke > MI	No	No
Social Support – D3 Information Provision	Proband	MI > others Non-Alz. Spouse > Alz. Spouse	<b>Yes</b>	<b>Yes</b>
D4 Kin-Keeping	Proband	Time Course: tapering as adaptation occurs	Incon- clusive	Incon- clusive
E1 Social Capital – Physical	Spouse	MI, Cancer > CHF, hip, stroke in Proband Time Course: unrelated to time proband sick	<b>Modest</b>	No
E2 Social Capital – Intellectual	Spouse	Non-Alz > Alz. in Proband Time Course: unrelated to time proband sick	Incon- clusive	Incon- clusive

Table 3.1: Summary of Hypotheses (continued)

Theory	Focus	Disease Ranking	Male Support	Female Support
<b>Investment Models</b>				
F1 Pure Investment	Proband	Time Course: gradual increase of relative hazard	No	No
F2 Investment + Shocks	Proband	Time Course: up, and increasing thereafter	No	No
F3 Investment + Shocks + Reinvestment	Proband	Time Course: Bereavement: Bad Ca, Lung Ca > CHF, Stroke > MI, Colon Ca	No	No
G Lillard & Waite Assets	Spouse	For women: CHF > Colon Ca, Lung Ca in probands		No
<b>Alternative Hypotheses</b>				
H Caregiving Fatigue Selection:	Spouse	within CHF, hip, stroke, the Hazard Ratio of loss decreases with time since diagnosis.	No	No
S1 Positive Assortative Mating	Either	Impact of marital status loss decreases with age	No	No
S2 Selection: Joint Health Shocks	Both	Increased likelihood of both being in COSI	No	No
S3 Selection: Joint Health Shocks	Either	Impact of loss less if spouse lost to cardiac arrest MI, CHF, lung > Colon, hip > CNS Ca., Lymphoma/Leukemia	Incon-clusive	Incon-clusive
S4 Selection: Joint Poor Health Behavior	Proband		Weak	Weak