A METHODOLOGY FOR IDENTIFYING MARRIED COUPLES IN MEDICARE DATA: MORTALITY, MORBIDITY, AND HEALTH CARE USE AMONG THE MARRIED ELDERLY*

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We describe a method for the development of cohorts of up to three quarters of the 14 million married couples aged 65 and over in the United States. The health care experiences, illness histories, and mortality of these identified couples can be assessed longitudinally using Medicare data. We summarize strengths and limitations of using data from Medicare administrative records for the study of marriage, health, and aging. We illustrate the method by demonstrating substantial differences in survival in a cohort of hospice patients as a function of not only the patient's own diagnosis and illness burden but also the patient's spouse's illness burden.

In 1995, the health care of 33 million elderly Americans was insured by the Health Care Financing Administration (HCFA) through the Medicare program. Because the annual premiums cover only about one fourth of the actual cost of the program, no private insurance companies can compete for the market. Hence, nearly all elderly Americans are enrolled in Medicare (U.S. House of Representatives 1996), and nearly every interaction of the elderly with the health care system is documented in Medicare's claims files. These data are a potentially useful tool for demographers studying the relationships between marriage, health status, medical resource use, and death. To facilitate such explorations, we (1) provide an overview of Medicare eligibility, explaining the varied ways in which individuals enter the system; (2) outline a novel technique by which up to 75% of husband and wife *pairs* can be identified in the Medicare enrollment data; (3) discuss the utility and limitations of enrollment and claims data for demographic research; and (4) provide an illustrative application of the identification method, exploring the effects of spousal illness on the duration of patient's use of hospice care, a form of terminal care.

OVERVIEW OF THE FILES

HCFA estimates that about 96% of the eligible population is enrolled in Medicare (U.S. House of Representatives 1996). Eligibility allows individuals to purchase insurance against the costs of hospitalization and other institutional care (Part A) and, separately, against individual providers' charges, primarily physicians (Part B). When an individual enrolls in Medicare, his or her identification, mailing, and demographic information is entered into the enrollment data base. All subsequent changes are distinctly recorded in this data base, leaving a history of past addresses and identification information (but no direct information on utilization). Claims filed under Part A or Part B are checked for validity with this central enrollment data base, and the demographic information present in the electronic claims files is taken from the enrollment file, not from the newly submitted claims form. These claims data, documenting each interaction with the health care system, are available for study (Fisher et al. 1990; Lauderdale et al. 1993; Mitchell et al. 1994).

It is crucial that social scientists recognize that the Medicare data are individual-level administrative records designed primarily to control the disbursement of funds (e.g., the $113.4 billion of institutional care Medicare paid for in 1995); the data certainly are not survey instruments. Because of their administrative origins, the demographic data available in the enrollment and claims records are sparse. Data on age and sex are available. Although there is a race/ethnicity code, it combines two distinct coding systems and has both conceptual and empirical problems—only black/white comparisons can be performed with confidence (Lauderdale and Goldberg 1996). The only income information directly available is whether the enrollee's premiums are paid by the state; this is means-tested at a level set by the federal government. For certain states, files for these Medicaid-eligible persons may also be available for linkage to provide additional information.

Neither information on marital status nor the identity of a spouse is directly available. However, the intricacies of the system by which individuals become eligible for Medicare allow the detection of substantial numbers of husband and wife pairs in the individual Medicare enrollment and claims data. Detection efficacy increases the further back the target year in which one seeks to identify spouses; that is, in 1997 it is possible to identify a higher proportion of the spousal

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This work was supported in part by a Geriatric Academic Program Grant from NIA, 5 K12 AG00488-06 (N.A.C.), and by a Medical Scientist National Research Service Award from NIH/National Institute of General Medical Sciences, 5 T32 GM07281 (T.J.I.). We thank Linda J. Waite for her critical review of the manuscript.

pairs existent in the 1990 data than in the 1996 data. However, the availability, format, and quality of the data vary before the mid-1980s.

MEDICARE ELIGIBILITY REQUIREMENTS

Most elderly who qualify for Medicare do so at age 65 by qualifying for Social Security. (Retirees or their dependents can receive Social Security when the retiree turns 62, but no one qualifies for Medicare through this route until he or she turns 65.) For the small minority who do not qualify for Social Security, there are four alternate paths to Medicare eligibility. The prevalence of these modes among beneficiaries is summarized in Table 1.

To qualify for Social Security benefits, one must have paid Social Security taxes for at least 40 quarters (10 years) at a "covered job" or be married to someone who has. Covered jobs now account for 96% of all jobs in the country (U.S. House of Representatives 1996). The balance consists of jobs in local and state government that are not covered by the Social Security tax provisions requiring contributions.

Rather than receive benefits for one's own work history, one can receive Social Security as the spouse (current or divorced) of an eligible worker. Most of those receiving spousal benefits are wives. Current wives are those married who have been married for at least one year *or* who are married and share natural parenthood of a child (20 Code of Federal Regulations 404.330). To qualify for divorce benefits, one must have been married for 10 years, be divorced for at least two years, and be currently unmarried (20 Code of Federal Regulations 404.331). Thus, a single primary beneficiary can have two or more spouses covered simultaneously. The distribution of beneficiaries in Table 1 suggests that there are nearly twice as many widows as wives. This is actually a result of a peculiarity of the benefit structure (explained in detail later), not some form of selectivity into Social Security.

Approximately 4% of Medicare beneficiaries become eligible through other means. Three quarters of a million citizens receive benefits from the Railroad Retirement Board, thereby qualifying for Medicare Part A (U.S. House of Representatives 1996). Federal workers (who did not pay into the Medicare system before 1983) still receive credit for each quarter they worked in government toward the required 40 contributory quarters (42 Code of Federal Regulations 406.15). Elderly individuals who do not qualify for Medicare under any of the automatic enrollment systems just described but meet certain means tests may enroll in the system as Qualified Medicare Beneficiaries; the state in which they reside pays the Medicare Part A and Part B premiums for these individuals. A residual group fails to meet this means test and does not qualify under any of the preceding conditions. These individuals have the opportunity to pay the full age-based actuarial cost of Medicare insurance and may enter the system in this way.

DETECTING SPOUSAL PAIRS

The complicated identification schemes necessary to manage such a varied system provide the implicit information necessary to detect husband and wife pairs in the HCFA data. When individual eligibility for Medicare is established through the Social Security Administration (or the Railroad Retirement Board), workers are assigned a Beneficiary Claim Number Group or Health Insurance Claim number (HIC), consisting of their Social Security number (or Railroad Retirement Board number) and a beneficiary identification code (BIC) designating them as a primary claimant. Those who qualify only as a dependent are assigned a HIC consisting of the identification code of the individual whose work record forms the basis of their entitlement and a BIC designating their relationship to the primary claimant. Individuals who are eligible both because of their own work experience and because they are spouses of covered workers are automatically assigned the code that yields the higher benefit. The Social Security Administration (SSA) updates the codes daily. The spousal benefit is 50% of the primary recipient's SSA benefit, based on the primary beneficiary's wages. Given this coding scheme, couples in which the woman earned less than half as much as her spouse are easily detectable in the Medicare claims records, as both members of the couple have HICs that share the initial nine-digit Social Security number of the primary recipient and differ only in their BIC. Note that the only relevant earnings are those taxed by Social Security; income above the taxable cap is not used in these computations.

Cross-tabulations from a 1% random sample of the Medicare enrollment file indicate that this method detects approximately one third of currently married couples in which both partners are over age 65. Table 2 compares the absolute number of women receiving benefits as spouses with the number of women estimated by the Current Population Survey (CPS) to be married in each of the age and race categories. Among whites, sensitivity increases from 32% of

TABLE 1. ORIGINS OF MEDICARE ENROLLEES

Type of Benefit	Number of Beneficiaries
Primary Recipients	24,875,280
Social Security	24,265,000
Railroad Retirement Board	314,300
Qualified Medicare Benficiary	295,980
Spouses	2,748,700
Social Security	2,560,000
Railroad Retirement Board	188,700
Widows/Widowers	4,751,000
Social Security	4,526,000
Railroad Retirement Board	225,000
Government Employment and Individual Purchase	423,000
Total	32,798,000

Sources: U.S. House of Representatives (1996), data for February 1996; *Social Security Bulletin* (1996), data for June 1996.

TABLE 2. NUMBER OF WOMEN RECEIVING SOCIAL SECURITY BENEFITS AS SPOUSES VERSUS THE NUMBER OF WOMEN ESTIMATED BY THE CURRENT POPULATION SURVEY (CPS) TO BE MARRIED, BY AGE AND RACE

	Age Group		
Variable	65–74	75–84	85+
All Women			
SSA	1,004.8	674.4	269.4
CPS	1,011.7	612.2	202.5
Ratio of SSA to CPS	0.99	1.10	1.33
Married Women			
SSA	170.9	73.4	9.3
CPS	536.4	186.1	19.6
Ratio of SSA to CPS	0.32	0.36	0.36
White Women			
All White Women			
SSA	884.4	605.2	241.3
CPS	895.2	553.8	181.1
Ratio of SSA to CPS	0.99	1.09	1.33
Married White Women			
SSA	158.3	68.7	8.9
CPS	493.9	174.8	17.9
Ratio of SSA to CPS	0.32	0.36	0.37
Black Women			
All Black Women			
SSA	90.1	53.6	22.4
CPS	89.5	47.8	18.5
Ratio of SSA to CPS	1.01	1.12	1.21
Married Black Women			
SSA	8.5	3.0	0.3
CPS	29.1	8.2	1.3
Ratio of SSA to CPS	0.29	0.33	0.20

Sources: Bert Kestenbaum, SSA Office of the Actuary, personal communication, 1997, for SSA data; U.S. Bureau of the Census (1996), for census data.

couples in which the woman is aged 65–74 to 36% of couples in which the wife is age 85 or over. Sensitivity is lower among black women: Using this simple method we can detect 29% of those couples with women aged 65–74, 33% of couples with women aged 75–84, but only 20% of couples in which the women is older than 85. In addition, 0.8% of men receive spousal benefits and can therefore be matched to their spouses through this method.

The preceding method allows us to detect a large fraction of the husband and wife pairs when both are alive or after the death of either spouse, if both lived to at least age 65. As time passes, a second method identifies additional couples. A woman who earned more than half as much as her husband is assigned a primary recipient code *while her husband is alive.* However, if her husband dies before her—and his wages were higher than hers—she is automatically switched to a widow benefit, equaling 100% of his (larger) benefit. A concomitant change in her Claim Number Group occurs from her Social Security number plus a primary recipient code to his Social Security number plus a widow code. This policy explains the nearly two-to-one ratio of widow to spousal beneficiaries: 4.8 million widows and widowers versus 2.7 million spouses as of February 1996. Of course, when a wife qualifies for a higher benefit and dies first, the same benefits are available to the husband.

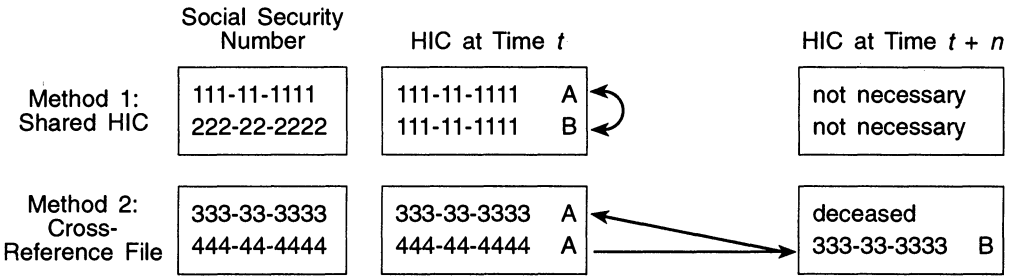
A cross-reference file of all the claim numbers a beneficiary has ever used is implicitly maintained by HCFA. Properly manipulated, this file allows the retrospective identification of couples who did not initially share the first nine digits of the Claim Number Group. This process is illustrated in Figure 1 and is most easily explained by example. All those receiving widow(er) benefits in 1997 are located in the cross-reference file. Some will have previously received benefits as a spouse, but the cross-reference file will record many as also having received benefits as a primary claimant. We can extract the Social Security number of a husband from one of the widow-coded claim number groups in 1997, changing the relationship code to see if he is present in the claims data as a primary claimant in some preceding year, say 1993. The year he was filing claims, his wife was also receiving benefits under her own Social Security number, which we also trace through the cross-reference file. Now we have identified a couple, both primary recipients in 1993, even though there is no indication in the 1993 claims records that they were a couple at the time.

Given an adequately long time, this method can be used to identify all married couples in which (1) both were enrolled in Medicare; (2) one partner earned more than the other (as relevant to the Social Security benefit); and (3) the higher-contributing partner died first. Among the currently retired, typically the higher earner is the male, and husbands will die first in approximately 70% of marriages in which both members are over age 65 (Schoen and Nelson 1974). In relationships in which the higher earner does not die first, we can still identify married couples in which one worker earned at least twice as much as the other.

Based on available data, we can project the proportion of couples that should be identified with this method. Estimates from the 1993 Vital Statistics data indicate that approximately 20% of married men over age 65 will predecease their wives within four years (U.S. Department of Health and Human Services 1991). Thus, adding these couples to those identified by the first method, we estimate that we can identify approximately 55% of all married Medicare claimants in 1993 as married and identify their then living spouses by 1997.

In principle, cohorts of up to 75% of the 14 million elderly married couples could be developed with this method, and their health care experiences, illness histories, and mortality could be assessed, given an adequate period to look back. This percentage compares favorably with other possible methods of data collection, such as the percentage re-

FIGURE 1. METHODS OF DETECTING SPOUSAL PAIRS



sponding to mail or telephone surveys (Asch, Jedrziewski, and Christakis 1998). Unlike surveys, however, data collected by HCFA are intensively checked for accuracy and completeness, undiluted by the movement of subjects across the country, and directly reflect actual behavior. Further, unlike surveys, the extent of the differences between those about whom data is collected and those excluded can be determined relatively easily.

LIMITATIONS OF SPOUSAL-PAIR DATA

This method of identifying spousal pairs has significant limitations. The couples that are detected are not a random sample of elderly married couples; couples with large age disparities or approximately equal lifetime earning histories will be significantly underrepresented. Furthermore, those who rely on the Veteran's Administration, the 3.7% of the age 65–69 male population that remains employed, and others who are predominately poor and not enrolled in Medicare will not be represented (Fischer et al. 1990). For simple mortality comparisons, these are the major limitations rooted in the enrollment data. A minor limitation and a possible concern for some research is the exclusion from Medicare of certain classes of aliens, recent immigrants, and most citizens receiving care overseas.

The second major limitation of our method relates to the identification of the unmarried. To explore the effects of marriage, one would have to construct comparable cohorts of married and unmarried. The method at hand identifies a nonrandom subsample of all beneficiaries who are married. The residual group, however, is clearly not just the unmarried. Some will be those with a spouse who is either much younger (and hence not a Medicare beneficiary) or who earned similar wages; others will be the lifelong single or widow(er)s.

Although it is not possible to identify the never married, other comparison groups based on detectable changes in status can be developed. The effects of widowhood can be studied for the same subsample that we can discern to be married. Linking all detected couples to the Vital Status File allows us to determine, to the day, when one partner dies, initiating widowhood. Likewise, cohorts of unremarried divorced individuals can be detected. The full BICs contained in the extracted claim records (though not the equatable BICs in the cross-reference file) distinguish those receiving benefits as dependent divorcees from those receiving benefits as dependent wives.

Beyond these difficulties, important variables of interest to those studying the family—kin-availability and income data, for example—are simply not present in unsupplemented claims data. In exploring the impact of marriage on the health of women, research has shown income to be of crucial importance (Lillard and Waite 1995). Only a crude binary variable, whether the individual passed the Qualified Medicare Beneficiary means test, is directly available to provide such information. In light of the origin of most Medicare beneficiary records in the detailed Social Security Administration lifetime income histories, this absence is particularly dramatic. However, several possibilities present themselves for partially ameliorating these deficiencies. Supplementary surveys conducted *de novo* are one option. Another is geocoding of enrollees' addresses, which provides the option of linking the data to the decennial census, with its rich area descriptions. (Contemporary mailing ZIP codes are present on each claim; retrieving full addresses requires access to the enrollment files.) Given that assets may be much more important than income per se in the lifestyle of the elderly, area-based income measures are unusually attractive. Further, the use of aggregated data removes year-to-year household-specific income fluctuations, better approximating permanent income. Naturally, each option has limitations.

More complicated studies that seek to take advantage of the rich medical information in the claims data suffer from two other types of limitations that warrant discussion: exclusions from the claims data and incompleteness of medical information.

The growing numbers of participants in Medicare managed care programs do not file claims. Before 1990, enrollment in Medicare managed care programs was negligible; currently, managed care patients account for 10% of the Medicare beneficiary pool. Efforts are now being made to encourage enrollment, however, and the Congressional Bud-

get Office estimates that managed care will cover 25% of Medicare beneficiaries in 2007. Because Medicare managed care providers are paid per beneficiary per month regardless of their enrollees' actual utilization, claims records for such individuals are generally not available from HCFA. In addition, there may be selection into and out of Medicare managed care plans on the basis of current health status (Morgan et al. 1997; but see also Riley, Feuer, and Lubitz 1996).

Finally, to complicate the use of the claims data further, their coverage across procedures and diagnoses is known to vary (Lauderdale et al. 1993; McBean, Warren, and Babish 1994). This is probably rooted in the linkage between the diagnosis given and the reimbursement the hospital receives. There is robust evidence that hospitals have begun "upcoding," that is, insuring that the most severe (i.e., most highly compensated) diagnosis is assigned to the patient (Carter, Newhouse, and Relles 1990; Cutler 1995). Thus, a patient's primary diagnosis may differ from a medical versus a claims/reimbursement perspective. Clearly, the severity of the problem depends on whether there is reason to believe that the detection efficacy varies systematically along an axis of substantive interest for the study.

Our method is not the only way spouses could be detected with Medicare data. For example, matching algorithms based on names and addresses could also be developed. Although such methods have the relative advantage of not misidentifying separated but legally married couples as together, they are computationally daunting and require substantially greater disclosure of personal identification information from HCFA (which, indeed, might render them infeasible). Difficulties also arise as the address information is not as consistently entered as the identification-number information. In addition, the possible gains in sensitivity of these potential matching algorithms may come at the expense of specificity, as siblings and people with common surnames may be misidentified as married, particularly when resident in group homes, where many people have the same address. For the study of the health of the elderly, it may be particularly important to match those institutionalized (such as in nursing homes) to their community-dwelling spouse; this could pose a difficulty for some address-matching schemes. Nevertheless, similar techniques may be useful and have been developed, for example, to identify cohorts of twins in claims data (Goldberg et al. 1997).

Access to Medicare data may be achieved by applying to the Office of Health Care Information Systems, Bureau of Data Management and Strategy, HCFA, in Baltimore, Maryland. After suitable bureaucratic review of the data request proposal, including of the confidentiality-preservation features of the research, data may be released in a number of forms. Descriptions, fees, and order forms for obtaining files are available in the publication *Public Use Files* (Health Care Financing Administration 1997).

AN APPLICATION

Our exploration of this technique for identifying married couples was prompted by a substantive application that can also demonstrate the research potential of the method (Christakis and Iwashyna 1998). We identified couples in the 1993 Medicare Standard Analytic File for Hospice augmented by the 1996 Cross-Reference File and other files, using previously described techniques (Christakis and Escarce 1996). The hospice file contains the claims filed by those in Medicare using hospice care in 1993. Hospice care focuses on reducing pain and suffering in the patient's final weeks and on providing a death consistent with the patient's preferences (Dawson 1991; Kidder 1992; Mor, Greer, and Kastenbaum 1988). Hospice care is usually provided in a patient's home, with family members assisted by visiting nurses and a multidisciplinary care team. To qualify for the Medicare hospice benefit, a patient must have less than six months to live, as certified by a physician.

Prior work has shown that there is substantial systematic variation in the length of survival after hospice enrollment across clinical and demographic attributes of the patient (Christakis and Escarce 1996). The origins of this heterogeneity are several and involve biological, behavioral, and social factors. The biological origin is related to differences in the time courses of different diagnoses; within diagnoses, the effects of comorbidity are also intelligible. Some of the heterogeneity is due to behavioral factors, with patients and physicians electing to use hospice care at different points before death. In the case of physicians, for example, this may be due to variation in prognostic practices (Christakis 1998; Parkes 1972). Physicians may also be slow to take into account patient preferences for the form of end-of-life care (the SUPPORT Principal Investigators 1995). Such factors may lead to late referral to hospice care relative to the anticipated time of death, reducing the effectiveness of hospice care. Therefore, it seems likely that the availability of advocates for the patients' interests or the availability of family members able to provide care might explain some of substantial remaining variation in patterns of hospice care use: A greater ability to look out for one's spouse would be expected to lead to earlier hospice care referral, and hence to longer survival after enrollment. That is, some of the heterogeneity in hospice care use may be social. To test this hypothesis, we used the Medicare data to explore the relationship between spousal illness burden and the length of stay in hospice care of the proband, the first member of each couple to enter hospice care.

After we cleaned the data, the Standard Analytic File recorded incident hospice care use for 184,843 individuals in 1993. Patients were linked at the individual level to the Medicare Vital Status files for mortality follow-up through August 20, 1996. At that point, all observations were censored, providing a minimum of 32 months of follow-up; at this date, only 4,815 patients (2.6% of the cohort) were alive. Based on the ZIP code of the probands' mailing addresses, we obtained information on the median educational and income levels from the 1990 U.S. Census.

Using the methods described here, we identified 524 couples in that group of 1993 hospice care users; that is, 0.56% of hospice care users were individuals whose (de-

tected) spouse also received hospice care during the same calendar year. It is likely to be extremely rare that both a husband and wife would become terminally ill and use hospice care in the same year. However, there are no available gold-standard data on the prevalence of this event to compare with our detection rates. Of these married couples, 332 (63.4%) were detected as dependent spouses in the 1993 hospice records; the remainder were detected using the 1996 cross-reference file and the subsequent widow(er) claimant number. Among these 524 couples, seven were detected as divorced and were excluded from this analysis.

Length of survival after hospice enrollment of the proband was used as the dependent variable in a Cox regression analysis. Covariates included the age, sex, race, diagnosis, and comorbidity burden of the proband and the age, diagnosis, and comorbidity of the spouse. We also controlled for the median levels of income and education of the ZIP code in which each couple resided. Comorbidity burden was measured by computing a Charlson score for each individual based on MEDPAR data files (Charlson et al. 1987; Deyo, Cherkin, and Ciol 1992); spousal Charlson scores were weakly correlated ($r = 0.17$).

There were substantial and significant differences in the proband's survival according to the proband's diagnoses, comorbidity, age, race, and sex: Sicker, older, white, male probands died more quickly (Christakis and Iwashyna 1998). In addition, however, the sicker the proband's *spouse*, the more rapidly the *proband* died after hospice care enrollment. These results, summarized in Table 3, indicate that the point of hospice enrollment is a function not merely of an individual's own attributes (including his or her illness burden, anticipated time until death, and demographic and clinical features) but also of the illness burden of the spouse. This variation occurs within a sample of spouses sufficiently sick that all would themselves use hospice care in the same calendar year.

TABLE 3. MEDIAN LENGTH OF STAY IN HOSPICE CARE AS RELATED TO THE PATIENT'S ILLNESS BURDEN AND THE ILLNESS BURDEN OF THE PATIENT'S SPOUSE

		Survival of the Proband (days)	
Illness Burden	*N*	Median	Interquartile Range
Of the Proband			
Low	139	141	41–788
Medium	130	93	19–453
High	248	30	11–126
Overall	517	54	16–275
Of the Spouse			
Low	145	109	29–420
Medium	129	93	16–477
High	243	33	13–165
Overall	517	54	16–275

Notes: This table shows the *unadjusted* survival from hospice enrollment for the proband. The algorithm used to compute the measure of illness burden (the Charlson score) depends on the number and type of previous hospitalizations; higher scores indicate greater illness burden (Deyo, Cherkin, and Ciol 1992). Patients with low illness burden had no prior hospitalizations in the preceding three years; those with medium illness burden had ≥ 1 prior hospitalizations and a Charlson score ≤ 2; and those with high illness burden had ≥ 1 prior hospitalizations and a Charlson score > 2. This pattern persisted in multivariable Cox regression as described in the text.

SUMMARY AND CONCLUSIONS

Our analysis builds on previous work demonstrating substantial heterogeneity in the type and, implicitly, quality of care for the elderly. Access to appropriately timed hospice care is a key instrument for achieving the type of good death that many Americans want but are not receiving (the SUPPORT Principal Investigators 1995). Additional research is necessary to differentiate whether this is the result of differences in preferences for end-of-life care by those with sicker spouses, or, as seems more likely, whether it is the result of the relative inability of sicker spouses of patients either to advocate successfully for conversion of the patient's care from a traditional, aggressive form to hospice care or to provide care for patients at home (as required for hospice care). Although aspects of the mechanism remain to be discovered, even in this small sample of quite sick spouses we documented, purely from existing administrative records, a significant difference in patients' health care utilization as a function of differences in their spouses' health.

Given the documented importance of marriage to understanding mortality patterns and its likely importance to morbidity, the ease of implementation of our technique (with its broad sensitivity and high specificity) in the Medicare claims data provides an opportunity for large-scale longitudinal analysis of questions central to the understanding of marriage and aging. Using linkages to other readily available data bases, researchers can partly overcome the paucity of immediately available demographic data and address the roles of income, education, region, and migration in health and mortality. The completeness, representativeness, and substantially greater size of the Medicare data recommend it as a productive complement to the handful of other national longitudinal studies that support the rigorous quantitative study of the demography of marriage and aging.

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