Marital Status, Social Support, and Health Transitions in Chronic Disease Patients

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PREFACE

This report presents results from analyses of data collected during the Medical Outcomes Study (MOS), an observational study of variations in physicians' practice styles and outcomes for patients in different systems of care. The MOS data were collected over a four-year period beginning in the fall of 1986. A description of the study can be found in a 1989 article by Alvin R. Tarlov, John E. Ware, Jr., Sheldon Greenfield, et al., "The Medical Outcomes Study: An Application of Methods for Monitoring the Results of Medical Care," *Journal of the American Medical Association*, Vol. 262, No. 7, pp. 925–930.

This report presents data from the first year of the study. It tests the hypothesis that being married results in better physical and mental health outcomes for chronic disease patients by increasing social support. Health outcomes one year later are modeled, controlling for initial health status. This report appeared in the December 1990 issue of the *Journal of Health and Social Behavior*, Vol. 31, pp. 328–343.

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Married persons tend to be healthier, both physically and mentally, than unmarried persons. We tested the hypothesis that being married results in better physical and mental health outcomes for chronic disease patients (N = 1,817) by increasing social support. We modeled health outcomes one year later, controlling for initial health status. Cross-validation studies of two random halves of the sample supported an indirect effect of marital status on mental health through social support, but did not support a relationship, direct or indirect, of either marital status or social support with physical health outcomes. In addition, specific types of functional support were not differentially predictive of mental health status.

In situations of serious illness, does marriage lead to better functioning and greater well-being? If this is the case, what element in the marital situation fosters these benefits? Is it something unique to the marital context itself, or is it the more general availability and provision of social support within marriage? In a sample of chronically ill persons, we test the hypothesis that married persons have more favorable health outcomes than the unmarried because more social support is available to them.

Most previous studies focused on general populations of healthy adults and found that married persons tend to have higher levels of well-being and mental health and fewer physical health problems than unmarried persons (Diener 1984; Gove 1972; Kessler and Essex 1982; Ross and Mirowsky 1989). Data from the 1987 National Health Interview Survey show that married persons are less likely than unmarried persons to be limited in their major activities, to rate their health as fair or poor, and to report days spent in bed or restricted activity days because of illness or injury (Schoenborn and Wilson 1988). People who are married have lower mortality rates (Berkman and Syme 1979; Kobrin and Hendershot 1977), enjoy better mental health (Gove, Hughes, and Style 1983; Pearlin and Johnson 1977), and use fewer health services (Evashwick, Rowe, Diehr, and Branch 1984; Morgan 1980; Verbrugge 1979) than the unmarried.

Once a person has become ill, does marriage promote physical and mental health? There is some evidence that marriage may influence the ability of those who are ill to cope effectively with their disease. For example, married patients have been shown to have better in-hospital and long-term survival rates after acute myocardial infarction (Chandra, Szklo, Goldberg, and Tonascia 1983). The unmarried, however, may turn to friends and relatives for support. In

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general, research suggests that married people rely more strongly on spouses, widowed persons on other relatives, and singles on friends (Altergott 1985). Insofar as supportive relationships are perceived to be available, they should be expected to affect the individual's health and well-being favorably regardless of marital status.

There is mixed evidence regarding the effects of social support on health outcomes (Cohen and Syme 1985), but we find some support for the notion that social support is associated with recovering and coping with serious physical illness and injury (DiMatteo and Hays 1981). For example, social support has been found to correlate with more favorable outcomes after husbands' myocardial infarctions (Finlayson 1976), with more rapid progress among stroke rehabilitation patients (Robertson and Suinn 1968), with better control among women receiving treatment for hypertension (Williams, et al. 1985), and with maintenance of individuals on antihypertensive therapy (Stahl, Kelley, Neill, Grim, and Mamlin 1984).

The means by which social support affects health have not been established. Interpersonal relationships provide a variety of specific supportive functions. Those cited most often are 1) emotional support that involves caring, love, and empathy; 2) instrumental or tangible support; 3) information, guidance, or feedback that can provide a solution to a problem; 4) appraisal support, which involves information relevant to self-evaluation; and 5) social companionship, which involves spending time with others in leisure and recreational activities (Cohen and Hoberman 1983; House 1981; Wills 1985). Measurement of multiple support functions is important because it enables one to determine whether particular resources affect health differently, and thus provides insight into the mechanisms linking social support to health (Cohen and Syme 1985). For example, the availability of someone with whom to have a good time may be less beneficial to the health of a chronic disease patient than the availability of someone to help with daily chores. In addition, the beneficial effects of different types of support may depend on the type of health outcome. Funch and Mettlin (1982) found that support from one's doctor and family influenced psychological adjustment to breast cancer but not physical recovery. House and Kahn (1985) concluded that emotional support is a more important predictor than other types of support for a variety of health outcomes.

The relationships among marital status, social support, and health outcomes are not well understood. Controlling for perceived social support (e.g., having someone to talk to and to turn to for support and understanding) had very little impact on the direct effect of marital status on depression; thus Ross and Mirowsky (1989) were led to conclude that most of the effect of marriage on reducing depression is not due to support. Their study, however, used only a global two-item measure of social support, examined only one health outcome, and had a cross-sectional design. Another cross-sectional study, conducted by Deimling and Harel (1984) on a relatively healthy older population, provided evidence that marital status may affect psychological well-being indirectly through social resources. The cross-sectional nature of both studies restricts conclusions about the directions of causality among marital status, social support, and well-being.

This paper addresses several unresolved issues. First, we examine the association between marital status and health outcomes for chronic disease patients. This is an important extension of previous studies because the chronically ill use health care services disproportionately and may be especially vulnerable to impaired functioning due to their chronic illnesses (Wilson and Drury 1984). Second, we test the hypothesis that the better health outcomes of married persons can be attributed to the availability of social support. Third, we examine both physical and mental health outcomes and the perceived availability of four types of functional support (tangible, emotional/ informational, affectionate, and positive social interaction) to determine whether the benefits of perceived social support vary by dimension of health status and type of support. We use a longitudinal structural equation model to evaluate these questions, controlling for initial health status and life stress events.

METHODS AND ANALYSIS PLAN

Study Population and Data Collection

The data are taken from patients participating in the Medical Outcomes Study (MOS),

an observational study of variations in physicians' practice styles and outcomes for patients in one of three different systems of care: health maintenance organizations, large multispecialty groups, and solo fee-for-service practice. Extensive details regarding the study are given in Tarlov, et al. (1989). To summarize briefly, we chose three study sites (Boston, Chicago, and Los Angeles) from standard metropolitan statistical areas with mature forms of each system of care. Within each system of care, we selected a representative sample of physicians (general internists, family physicians, cardiologists, endocrinologists, diabetologists, psychiatrists), psychologists, and other mental health providers. All eligible physicians associated with the health maintenance organizations and large multispecialty groups were asked to participate in the study (85% were enrolled; N= 26). In the single-specialty solo or small group practice sector, we used a multistage selection process. In the first stage, clinicians initially were selected by stratified random sampling from lists provided by national professional associations (N = 2219). We contacted 69 percent of these individuals. Through telephone interviews we identified 513 eligible physicians (i.e., between the ages of 31 and 55, board eligible/certified or licensed for independent practice, and listing direct patient care as their primary professional activity) who agreed to a final selection interview. Of these physicians, 298 (58%) participated in the main study.

Among participating providers, we studied a representative cross-section of their patients. We screened all adult patients who visited one of the MOS clinicians during an average nine-day period. We excluded patients who were under age 18, did not speak English, or were physically impaired in a way that would prevent them from completing forms (e.g., blindness). For each participating physician, we created a log of all patients scheduled to visit the provider during each day of screening; this log represented the sampling frame from which patients were drawn.

Our final cross-sectional sample included 21,481 patients. The sampling frame for the longitudinal patient panel (N = 8,040) consisted of patients screened who appeared to have one or more of four chronic diseases:[1] hypertension, diabetes, coronary heart disease, and depression. Hypertensives were chosen on the basis of systolic and diastolic blood pressure readings reported by physicians; coronary heart disease patients consisted of those who had suffered a myocardial infarction within 12 months before screening and/or had congestive heart failure; diabetics were selected on the basis of physicians' reports of current diabetes, age of onset, and complications; depressed patients were sampled in a two-stage screening procedure (Burnam, Wells, Leake, and Landsverk 1988). Then we used a telephone interview to collect additional information and to ask eligible patients to enroll in the longitudinal panel.

The final enrolled sample included those patients who agreed to enroll in the study and who completed the initial patient assessment questionnaire, a physical health examination, and a calendar diary (N = 2,349). For some of the patients, we relaxed these requirements to maintain adequate sample size in each tracer condition. Patients who enrolled in the MOS were younger, were better educated, had higher incomes, and were more likely to be married or employed than were patients who refused enrollment. Yet because we can control statistically for these demographic differences as well as for the respondents' initial health status, this source of bias is not a great concern for the longitudinal analyses presented in this paper.[2]

The information included in this paper is based on a sample of adult (ages 18 and older), English-speaking patients who enrolled in the two-year longitudinal study during fall 1986 and completed both the enrollment and the first-year self-administered patient assessment questionnaires. For the present analyses, we excluded two groups of MOS patients: 1) those sampled from the offices of mental health providers, because medical and mental health provider groups deliver very different styles of mental health care and treat patients with different levels of functioning and disease severity, and 2) patients classified as having current major depression. We excluded this latter group because their demographics, functioning, and course of disease are very different from those of patients with only medical conditions. The MOS depressed patients are much younger (mean age = 40), are less likely to be married than the MOS medical condition patients, and are more likely to be female, white, and more highly educated. Their

functioning is poorer than that of medical condition patients, except for patients with current heart conditions (Wells et al. 1989). From a clinical perspective, the medical condition patients have progressive illnesses that are expected to grow worse over time, whereas depression is an episodic disease and depressed patients are expected to improve over time. Including these patients in this study would have compromised the generalizability of the results to other medical patients.

Of the 1,938 patients who completed the patient assessment questionnaire at the end of the first year (and thus supplied health outcome data), 1,817 furnished relevant enrollment data. (Because of the large number of constructs assessed, patients at baseline completed two questionnaires, Form A and Form B. The social support and life events items were included in the Form B questionnaire.) Of these 1,817 respondents, 537 were excluded either because they were sampled in the office of a mental health provider or because they suffered current depression.[3] We dropped an additional 405 from the sample because of missing data on one or more of the variables included in the present analysis, leaving an analytic sample of 875.

We estimated the sample bias due to missing data by comparing demographic characteristics and health and functioning at enrollment for those having missing data (N = 405) with corresponding information for the final sample of 875. Results showed that the patients excluded for missing data were more likely than the final sample to be single, older, and less educated. There were no significant differences between the two groups in physical, role, or mental functioning, number of comorbid conditions, severity of tracer condition, and level of social support.

The final sample, then, included 875 patients with one or more of the MOS medical conditions, who had complete data at enrollment and at the end of the first year of the study. For this sample, ages ranged from 20 to 98 (mean age was 60). Forty-eight percent were male, 18 percent were nonwhite, 66 percent were married, and 46 percent had completed high school (average education was 13.3 years).

Study Variables

The appendix contains a summary of the major study variables, their operational definitions, internal consistency reliability coefficients (for multi-item measures) and one-year stability correlations, where available.

The dependent variables are physical and mental health constructs. We used three indicators to represent each of the two types of construct. Mental health was represented by multi-item measures of feelings of anxiety, loss of emotional or behavioral control, and positive affect in the past month. These measures are subscales of a 38-item Mental Health Inventory (MHI) developed for the Health Insurance Experiment (HIE) and modified for the MOS (see Veit and Ware 1983, Ware, Johnston, Davies-Avery, and Brook 1979). They represent both positive and negative emotional states, and have been shown to be highly reliable and valid (Cassileth et al. 1984; Ware, Davies-Avery, and Brook 1980).

Physical health was represented by measures of physical functioning, role limitations due to physical health problems, and satisfaction with physical abilities. Physical functioning assesses current capacity to perform a variety of physical activities such as bathing, dressing, running, and participating in strenuous sports. Role limitations assess the degree to which people report that they were unable to perform work or usual daily activities during the past month because of physical health problems. The satisfaction measure is a single-item question about the extent to which the subject is satisfied with his or her physical abilities. These measures have a long history of development in both the HIE and the MOS (Stewart et al., 1990; Stewart, Ware, and Brook 1981). The discriminant validity of the physical and mental health constructs has been demonstrated (Hays and Stewart 1990).

Social support was represented by four multi-item measures of the availability, if needed, of distinct types of functional support: 1) tangible support, involving the provision of material aid or behavioral assistance; 2) affectional support, involving expressions of love and affection; 3) positive social interaction, involving the availability of other persons to do pleasurable things with; and 4) emotional/informational support, involving the expression of positive affect, empathetic understanding, and the offering of

advice, guidance, or feedback. For each of the 17 items used to score these scales, respondents were asked to state how often each kind of support was available to them if needed. The five-choice response scale for each item ranged from "none of the time" to "all of the time." These items were derived from a larger pool of 50 items that we had constructed (and subsequently pretested) from measures and dimensions of social support identified in our review of the literature (Sherbourne and Stewart, in press).

Our support measures focus on the perception of the availability of different functional aspects of support (e.g., the degree to which interpersonal relationships serve particular functions) rather than on more objective structural measures of support (e.g., the existence and quantity of social relationships and their interconnectedness) or of received support. Received support is confounded with need, and may not reflect accurately the amount of support that is available to a person. Furthermore, in view of limited measurement resources, the most essential aspect of social support is the perceived availability of functional support (Cohen and Syme 1985; Cohen and Wills 1985; House and Kahn 1985).

Because previous research had shown that life stress events also affect health outcomes, we included one multi-item measure and two single-item questions about life events. The Life Event Index contains 20 items that measure the occurrence during the past year of events in several categories: bereavement, interpersonal relationships, living conditions, work, finances, and crime. The single-item measures ask subjects to rate the degree of change in their life during the past 12 months and the frequency with which they felt that those changes were overwhelming.

To control for initial health levels, we included in our analyses the enrollment versions of the self-report physical and mental health variables. We also included five demographic and socioeconomic variables (marital status, age, education, race, and gender) and disease-specific measures of severity and comorbidity.

Analysis Plan

We calculated unadjusted mean scores for our enrollment health variables for married and unmarried subjects to determine whether the differences in health by marital status found in general population surveys and in previous studies would replicate in our chronically ill sample. We used analysis of variance methods to test for significant differences among the unadjusted means. In addition, we examined unadjusted social support and life event mean scores for the married and the unmarried to determine whether the two groups differed in the amount of support available and the number of negative life events experienced. To learn whether these results were sensitive to sociodemographic differences that also may be related to health and social support, we used regression methods to estimate mean health, social support, and life events scores by marital status, controlling for age, gender, race, and education.

We used two subsamples to test our major hypothesis that being married affects physical and mental health outcomes of chronically ill patients by increasing social support. First we evaluated the hypothesis on a random half ($N = 447$) of the respondents for whom complete data were available at two points in time. Then we evaluated the model on the remaining random half ($N = 428$) of the sample (i.e., a cross-validation sample). A chi-square test of homogeneity of group covariance matrices for the two random halves was statistically significant (chi-square = 646.69, df = 465, $p < .01$); this result showed that the covariance structures differed significantly in the two subsamples. The chi-square statistic, however, is influenced by sample size: in large samples like ours, trivial differences between groups can lead to statistical significance. Inspection of the covariance matrices in the two random halves revealed strong similarity, as expected. The correlation between corresponding elements in these two matrices was 0.99.

We used structural equation modeling (SEM) to evaluate the hypothesized relationships among marital status, social support, and health. Unlike multiple regression, SEM permits the simultaneous estimation of direct and indirect effects on dependent variables. Thus a variable may affect one or more variables and also may be affected by one or more other variables (Kerwin, Howard, Maxwell, and Borkowski 1987). In our hypothesized model, for example, social support functions as both a dependent and an

independent variable. In addition, because the paths connecting different constructs involve latent (as opposed to measured) variables, bias stemming from random measurement error is eliminated (Judd, Jessor, and Donovan 1986). Hence this model produces "truer" estimates of structural paths than do procedures that rely on measured variables.

To evaluate the model's goodness of fit, we present the chi-square statistic and three measures of practical fit: rho, delta, and the comparative fit index (Bentler 1990; Bentler and Bonett 1980). Because the sample size analyzed here is large, we relied on these measures for evaluating models.

We used model modification (labeled "specification search" by MacCallum 1986) to improve the adequacy of our initial model. Both the Lagrange multiplier (LM) procedure and the Wald test were used in the model modification process. The LM indexes suggest parameters that, if estimated, would improve the fit of the model. The Wald test can be used to identify parameters that could be dropped from the model without diminishing the level of fit. Both procedures provide univariate and cumulative multivariate chi-square statistics that are asymptotically equivalent to chi-square differences tests (Bentler 1989). The use of parsimony has been advocated (Bentler and Movijaart 1989) as one criterion for model specification: that is, all other things being equal, a model with fewer parameter estimates is preferable. As tests of theory, however, modified models should be regarded as provisional—that is, requiring replication. For this reason we accepted only a model with paths that were replicated in both random halves of our sample, as recommended by Cudeck and Browne (1983).

We report results based on maximum-likelihood estimation. Yet because the measured variables evaluated here tended to be significantly kurtose, with Mardia's (1970) normalized coefficient of multivariate kurtosis equal to 39.16 in the first random-half subsample, we confirmed maximum-likelihood results using an asymptotically distribution-free estimation procedure (Browne 1984). As in previous research, results were robust across both methods (Huba and Harlow 1987).

Standardized and unstandardized parameter estimates are reported. We focus on standardized estimates because the need to impose a metric on latent variables requires a form of standardization, except in unusual circumstances (Bielby 1986). The merits and problems associated with standardization are given elsewhere (Kim and Ferree 1981). Six latent variables were hypothesized: a mental health factor both at enrollment and at the end of Year 1 of the study, a physical health factor both at enrollment and at the end of Year 1, a social support factor at enrollment, and a life events factor at enrollment (see Figure 1). we used confirmatory factor analysis to evaluate the measurement model.

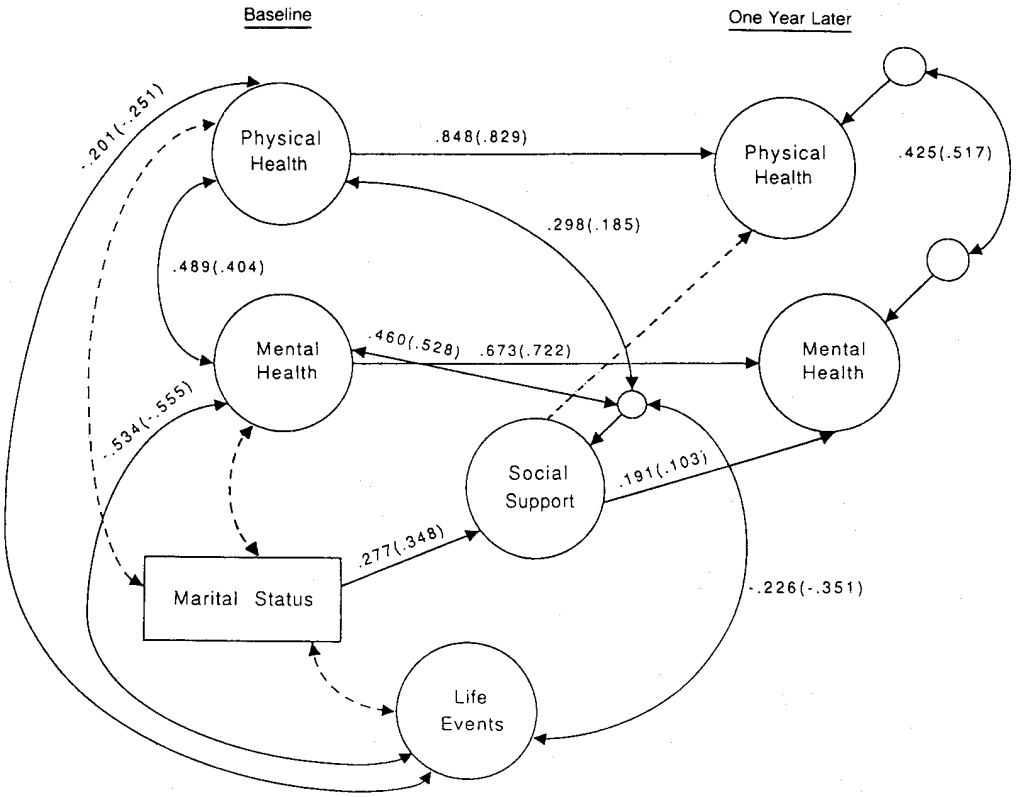
We hypothesized direct effects of social support and baseline health on physical and mental health at follow-up. Indirect relationships of marital status through social support to health were hypothesized. We ran models with and without controlling for sociodemographic variables (age, gender, race, and education), disease severity, and comorbidity. Because the substantive results were not affected by whether these casemix variables were included, we present results here for models without those variables. Other theoretically possible paths not hypothesized originally (e.g., direct effects of marital status and life events on physical and mental health at follow-up) were tested with the LM procedure.

To determine whether the benefits of social support vary by type of support, we evaluated both the unique and the combined effects of our social support measures on physical and mental health at follow-up. The generic effect of social support was modeled as a direct effect of the social support latent variable. We used LM tests to evaluate possible direct effects of specific types of social support on health status.

RESULTS

Table 1 presents unadjusted mean health, social support, and life event scores for married and unmarried subjects at baseline of the study. Married subjects reported significantly better physical functioning than did the unmarried. Married subjects also reported fewer comorbid conditions, fewer feelings of depression, and less loss of behavioral/emotional control. Married subjects were more likely than the unmarried to have severe diabetes. We found no significant differences between the two groups in satisfaction with

FIGURE 1. Hypothesized and Final Structural Model



NOTE: Large circles represent the latent variable; the small circles are residual variances. Double-headed arrows indicate correlations; single-headed arrows depict direct effects of one variable on another. Hypothesized effects dropped from the final model are shown as dashed lines. Standardized maximum-likelihood parameter estimates for each random-half sample are presented (estimates for the second random half are given in parentheses).

physical ability, role limitations, positive affect, level of anxiety, or presence and severity of congestive heart failure, hypertension, or myocardial infarction. We obtained similar results when scores were adjusted for age, gender, race, and education, with one exception. Adjusted mean differences in number of comorbid conditions between married and unmarried patients were not significantly different.

Married subjects reported the availability of significantly more support of all types than did the unmarried. Married subjects also reported significantly less life stress, less degree of change in their life during the past 12 months, and less feeling that changes in their life were overwhelming. Means adjusted for age, gender, race, and education showed the same pattern of results.

We estimated a confirmatory factor model for the 19 indicators of the six latent variables. The model was statistically rejectable, but it fit the data reasonably well according to practical fit criteria (delta = 0.89 and 0.88, rho = 0.89 and 0.87, fit index = 0.91 and 0.90 for the first and the second random halves respectively). All parameter estimates were statistically significant and large in magnitude. Standardized factor loadings for the first random-half sample ranged from 0.63 to 0.93. Results were comparable for the second random half. (These estimates are available on request.) These findings confirmed that the specific measures (i.e., indicator variables) adequately represented their theoretical constructs.

Next we specified the model depicted in Figure 1. Although the model was rejectable statistically because of the large sample size, it fit the data well in terms of practical fit (fit indices > 0.90). On the basis of results of the Wald test, we modified the initial model by eliminating four parameter estimates that were nonsignificant in one or both subsam-

TABLE 1. Unadjusted Mean Health, Social Support, and Life Event Scores for Married and Unmarried Subjects at Baseline

Measure	Married		Unmarried	
	Mean	SD	Mean	SD
Health				
Physical functioning*	74.82	23.79	65.30	28.65
Satisfaction, physical ability	63.06	23.83	61.87	24.56
Role limitations	40.36	39.02	44.82	40.89
Positive affect	69.06	18.65	67.36	19.44
Depression/loss of control*	12.83	12.99	15.24	15.14
Anxiety	19.37	16.96	17.75	17.05
Comorbidity*	0.69	0.69	0.82	0.72
Severity/congestive heart failure	1.10	0.31	1.12	0.33
Severity/diabetes*	1.66	1.21	1.48	0.95
Severity/hypertension	1.82	0.99	1.91	1.01
Severity/myocardial infarction	1.05	0.32	1.03	0.23
Support				
Emotional/informational*	77.79	23.24	65.58	27.70
Affectionate*	86.03	20.65	69.15	29.08
Positive social interaction*	81.04	21.46	65.54	25.64
Tangible*	83.47	20.26	62.47	29.13
Life Events				
Life events index*	1.14	0.15	1.17	0.18
Life event change*	1.99	0.94	2.14	1.02
Life event magnitude*	1.70	1.10	2.01	1.27

* Married and unmarried group means are significantly different from one another ($p<.05$).

NOTE: Scores for the first six measures range from 0 to 100; a high score is consistent with the scale name (e.g., a high score on physical functioning means better physical health whereas a high score on role limitations means more limitations or poorer health). Comorbidity ranges from 0 to 3; severity of congestive heart failure, diabetes, hypertension, and myocardial infarction range from 1 to 2, 1 to 7, 1 to 5, and 1 to 3 respectively. Social support scores range from 0 to 100; the life events index ranges from 1 to 3; life event change ranges from 1 to 4; life event magnitude ranges from 1 to 6.

ples: the direct effect of social support on physical health and the correlations of marital status with life events, physical health, and mental health at baseline. LM tests showed that estimating the direct effects of marital status and life events on future physical and mental health would *not* improve the fit of the final model, nor would estimating the direct effects of unique types of social support (e.g., emotional support) on mental health. The beneficial influence of social support on mental health is therefore a generic effect not specific to certain forms of social support.

The final model resulting from these modifications was rejectable statistically, but it fit the data well in terms of practical fit (see Table 2). The four direct across-time time effects for this final model are given in Table 3; the final model is depicted in Figure 1. Figure 1 presents standardized parameter estimates for each random-half sample (estimates for the second random half are given in parentheses). Parameters dropped from the initial model are indicated by dotted lines. Results using asymptotically distribution-free estimation were consistent with those reported here for maximum likelihood estimation. The final model shows that physical and mental health were stable over the study year (standardized parameter estimates for the first random half were 0.85 and 0.67 respectively). Neither marital status nor social support predicts better physical health outcomes over a one-year interval, but marital status predicts mental health indirectly through social support.

DISCUSSION

In this study, marital status was hypothesized to affect physical and mental health outcomes through social support. Mean health scores (both unadjusted and adjusted for sociodemographic characteristics) showed that married persons at a point in time (the baseline of the study) were healthier than unmarried persons along a number of different physical and mental health dimensions, even though all subjects had one or more chronic illnesses. After initial health levels and social support were controlled, however,

TABLE 2. Goodness of Fit for Structural Equation Models (First and Second Random Half Samples)

Model	DF	Chi-Square	Delta	Rho	Fit Index
Confirmatory Factor Analytic					
Null	171				
First half		5992.742	—	—	—
Second half		5950.027	—	—	—
Confirmatory model	137				
First half		651.493	0.89	0.89	0.91
Second half		722.134	0.88	0.87	0.90
Full Structural Model					
Null	190				
First half		6107.477	—	—	—
Second half		6104.419	—	—	—
Initial model	150				
First half		391.462	0.94	0.95	0.96
Second half		331.579	0.95	0.96	0.97
Final model	154				
First half		404.662	0.93	0.95	0.96
Second half		342.630	0.94	0.96	0.97

marital status did not predict better physical health outcomes over a one-year period. Marital status predicted mental health indirectly through social support, as hypothesized. Thus results based on cross-validation studies of two random halves of the sample supported the indirect effect of marital status on mental health through social support, but did not support a relationship, direct or indirect, of either marital status or social support with physical health outcomes. These results show that marital status has a positive effect on *change* in mental health (but not physical health) through social support during a one-year period.

In keeping with previous research, social support was found to affect mental health. We found better mental health among chronically ill patients who perceived the availability (if needed) of different types of functional support. We did not test the buffering hypothesis (i.e., that social support modifies the effect of stress on health outcomes). A test of the buffering hypothesis would have required us to include an interaction term to see whether the positive effect of social support on mental health increased with life stress. Because of their chronic conditions, all of the MOS patients were under stress to some extent. Thus the beneficial effects of social support on mental health may reflect a buffering of health-related stress. The MOS patients vary greatly, however, in severity and degree of functional impact of their conditions. For example, patients with hypertension suffer significantly less decrement in functioning than patients with heart disease (Stewart et al. 1989), and there is substantial variation in functioning and well-being *within* each chronic condition group. Future MOS studies will focus on whether social support modifies the effect of life stress events on health outcomes and whether social support is more beneficial for severely ill patients than for those with minor conditions.

We also did not test whether life stress mediates the beneficial effect of marriage on health. Unadjusted mean scores showed that

TABLE 3. Direct Across-Time Effects in Final Structrual Model, Parameter Estimates for Two Random Halves

Predictor Variable		Consequent Variable	Standardized Parameter Estimate[a]	
Observed	Latent	Latent	First Half	Second Half
Marital Status		Support	.277 * (0.598)	.348 * (0.798)
	Physical	Physical	.848 * (1.601)	.829 * (1.480)
	Support	Mental	.191 * (0.292)	.103 * (0.154)
	Mental	Mental	.673 * (1.069)	.722 * (1.149)

* $p<.05$.

[a] Unstandardized parameter estimates appear in parentheses.

married persons reported fewer life events, but life events did not have a direct effect on physical or mental health outcomes in our model. This was a conservative test of the effect of life events on health outcomes because our life event questions asked about events that had happened a year before baseline (and thus two years before health outcomes were measured). When we modeled the direct effect of life events on social support, our results (not shown here) supported a link between life stress and less perceived availability of social support. Therefore life events may have a negative effect on mental health through social support (but the direction of the effect between life events and social support cannot be established with these data).

We found that the perception of the availability of specific types of social support (e.g., tangible versus informational) did not add significantly to the prediction of better mental health outcomes over and above the effect of generic social support. Further research needs to examine additional outcomes (e.g., cognitive functioning) to determine whether certain types of support are more important for some outcomes than for others.

Neither social support nor marital status predicted physical health outcomes. This finding is surprising in view of previous studies that suggest the beneficial effects of support on a variety of physical health outcomes for subjects recovering from and coping with serious physical illness and injury (Finlayson 1976; Robertson and Suinn 1968; Stahl et al. 1984; Williams et al. 1985). Many of these studies, however, did not control for initial health status and disease severity; social support in these studies may have been a proxy for absence of disease. Illness may decrease support if it leads others to feel inadequate at providing support or to fear for their own health (Wortman and Conway 1985). Thus any effects of social support on physical health outcomes in these studies may have been due to uncontrolled disease status and severity. A similar argument can be used to explain why marital status was found to be related to physical health in previous research but not in this study. Because we controlled for initial health status, our estimates of the effects of social support and marital status on subsequent health outcomes were not confounded by spurious covariation. In addition, physical health outcomes were relatively stable during the one-year observation period used here. Thus only a relatively small among of change in physical health could be explained by social support and marital status in this study.

Limitations of the Study

This study cannot determine whether the results reported here are unique to our sample of chronically ill persons. Because our respondents were ill to begin with, our results may not be true of all patients or of people in general. Nonetheless, the chronic conditions represented in this study were chosen specifically because they have a high prevalence in the general population and because treatments known to be efficacious have been shown to have a substantial impact on patients' functional status and well-being.

Several other sources of bias associated with our sampling methods may restrict our ability to generalize to other patients or to people in general. The desired sample frame consists of noninstitutionalized adults with one of our tracer conditions. The MOS sample, however, differs from this ideal. Because we sampled patients at the time of a visit, those who visit the doctor frequently are overrepresented (this phenomenon often is called "length-biased sampling"). A second bias of the study is that patients of doctors who screened for fewer days had a lower probability of being included (i.e., bias associated with the length of the screening period). A third bias is that we sampled visits, and patients tend to be sick when they visit the doctor. To test the sensitivity of our conclusions to these biases, we weighted our sample for sampling probabilities associated with each source of bias and re-estimated the final model using the same cross-validation procedure. This sensitivity analysis yielded the same results as those reported for the unweighted sample. Thus we are confident that our findings can be generalized to the larger population of people who have the MOS medical tracer conditions.

Another source of bias arises because patients in the MOS longitudinal panel were enrolled through a multistage process and could refuse to participate at several points. Our cross-sectional data allowed us to describe (and control for) any selection bias in

the subsequent sampling. Patients who enrolled in the MOS were younger, were better educated, had a higher income, and were more likely to be married or employed than were patients who refused enrollment. Yet, because we controlled statistically for these demographic differences as well as for the respondents' initial health status, this source of bias is not a major concern in the longitudinal analyses presented here. The group excluded because of missing data was more likely than the final sample to be single, older, and less well educated. There were no significant differences between the two groups in physical, role, or mental functioning, number of comorbid conditions, severity of tracer condition, or level of social support. To test the sensitivity of our conclusions to the exclusion of subjects with missing data, we re-estimated the final structural equation model (using the same cross-validation procedure) with missing values imputed (substituting the sample means for missing variables) and obtained the same results. Thus we are confident that our results were not biased by excluding persons with missing data.

A final source of possible bias is that the MOS design nests patients within providers. Insofar as outcomes for patients of a given physician are not independent, the "effective" sample size is reduced, and it is necessary to correct standard errors and t-statistics for lack of independence. On the basis of cross-sectional data analyzed to date, the within-provider correlations for variables such as those examined in this study are small. Also, the size of the clusters (i.e., the number of patients per provider) is not very large. Thus corrections to standard errors for within-provider clustering would be unlikely to affect the conclusions we draw from these data.

Conclusions and Recommendations for Future Research

Our results are a master of particular policy interest because they focus on patients with tracer conditions that account for most health care expenditures. Because chronic conditions are incurable, the medical community is concerned with identifying the factors that can improve and maximize patients' functioning and well-being. Improvement of functioning and well-being should not only affect quality of life, a primary concern of patients and their families; it also may decrease societal costs associated with loss of productivity and use of health services. The importance of identifying other factors that predict outcomes is underscored by previous findings that most of the variance in functioning and well-being is not explained by the presence of a chronic condition (Stewart et al. 1989). Our finding that mental well-being is enhanced by social support—more readily available through the marital relationship—has implications for treatment considerations for the chronically ill. Providers of health care need to recognize unmarried status as a risk factor in patients with chronic disease conditions and attempt to minimize adverse mental health outcomes by increasing the availability of social support.

In future studies it will be important to divide marital status into married and unmarried living alone versus unmarried living with others. Because nonmarried people are more likely than married people to live alone, the relationship of marital status to health may have more connection with living arrangement than with marriage itself. It also may be important to break down marital status by gender because the relationship between marital status and some health outcomes (e.g., depression) varies by gender (Kessler and Essex 1982). In addition, the relationship between social support and mental health has been shown to be stronger for women than for men (Antonucci and Akiyama 1987).

"Marital happiness," or the quality of the marriage (Gove et al. 1983; Renne 1971), may predict well-being better than does marital status per se. Renne (1971) found that divorced people, regardless of marital history, were consistently healthier than the unhappily married. Happily remarried people generally were healthier than the divorced who had not remarried; this finding suggests that divorce and remarriage select the healthier members of the unhappily married population. In future studies we intend to determine whether the effect of marital status on mental health interacts with family and marital satisfaction.

Additional work also is needed to clarify the directional relationships among marital status, social support, and health. To what extent do people who are supported (or who are married) have better health outcomes than people without supports? Do healthier people develop supportive relationships (i.e., are

they more likely to get married), or do the effects operate in both directions? These questions are promising avenues for future research.

NOTES

1. The MOS patients were chosen to represent selected chronic conditions or "tracers." The MOS tracer design is "analogous to the use of radioactive tracers to evaluate bodily function" (Tarlov et al. 1989, p. 928). Patients with the selected chronic conditions provide a means for evaluating health outcomes produced by the type of medical care received as well as by individual and social factors.
2. Demographic bias resulting from enrollment differences are unlikely to alter the structural relations examined here. Interactions between sociodemographic variables and social support tested in the MOS so far have been found to be nonsignificant or weak in predicting health outcomes. This finding leads us to believe that the structural paths are robust to the sample definition. We cannot be sure, however, that our results generalize to all patients with chronic medical illness.
3. To reduce costs of case finding for depressive disorder in the MOS sample, we used a two-stage case identification procedure. A brief self-report screener for current depressive disorder was administered to all patients; those scoring above the cut-point were evaluated extensively for depression in a telephone interview (Burnam et al. 1988). Thus lifetime depressive diagnosis was possible only for those scoring above the screener cut-point and completing the telephone interview.

APPENDIX

Table A presents a summary of the major study variables, their operational definitions, internal-consistency reliability coefficients (for multi-item measures), and one-year stability correlations, where available. The physical and mental health and the social support variables were measured on self-administered questionnaires twice: at enrollment in the study and one year later. To test our hypothesis, we used only social support data from enrollment. Studywide concern about respondents' burdens led to the decision to assess life events only at enrollment. We measured five demographic and socioeconomic variables (marital status, age, education, race, and gender) during the screening interview, about three months before enrollment. Measures of disease severity and comorbidity were derived from patients' and physicians' reports obtained in the screening interview. We combined the information from both sources, using algorithms to construct measures of the probability that the patient had the disease and of the severity of the disease (i.e., the degree of pathology associated directly with a particular tracer condition as well as any iatrogenic conditions arising from treating the tracer condition). A high score on each severity measure means both a higher probability of having a given disease and a more severe level of the disease. We also included a measure of comorbidity based on symptoms (other than those indicative of the four chronic disease conditions) that might affect the patients' outcome.

APPENDIX TABLE A. Definitions and Reliability of Analytic Variables

Measure	Number of Items	Definition	Alpha[a]	Stability[b]
Mental Health				
Anxiety	3	Feelings of nervousness, restlessness, tension in past month	.84	.68
Loss of control	8	Feelings of depression and lack of behavioral/ emotional control, past month	.92	.70
Positive affect	4	Feelings of happiness and optimism in past month	.88	.71
Physical Health				
Physical functioning	10	Extent to which health interferes with a variety of activities (walking)	.93	.76
Role limitation/ physical	4	Extent to which physical health problems interfere with usual daily activities	.87	.56
Satisfaction with physical ability	1	Satisfaction with physical ability to do what you want	[c]	.62
Social Support				
Tangible	4	Frequency someone available to provide aid or assistance, if needed	.92	.74
Affectionate	4	Frequency someone available to express love and affection, if needed	.92	.76
Positive interaction	3	Frequency someone available to do fun things with, if needed	.94	.72
Emotional/informational	6	Frequency someone available who is supportive and provides advice	.96	.72
Life Events				
Life event index	20	Occurrence/effect of one or more life events in the past 12 months		
Change	1	Amount of life change in past 12 months		
Magnitude	1	Extent to which changes in life were perceived as overwhelming		
Control Variables				
Marital status	1	Scored 1 if married, 0 otherwise		
Age	1	Age in years		
Sex	1	Scored 1 if male, 0 otherwise		
Race	1	Scored 1 if nonwhite, 0 otherwise		
Education	1	Number of years of education completed		
Severity/congestive heart failure	—	Based on report of congestive heart failure and on history of heart failure and other symtoms		
Severity/diabetes	—	Based on diagnosis and duration of diabetes, insulin use, and organ complications		
Severity/hypertension	—	Based on diagnosis of hypertension, medication use, and blood pressure readings		
Severity/myocardial infarction	—	Based on presence of angina, congestive heart failure, and premature ventricular contractions		
Comorbidity	15	Sum of 15 chronic disease conditions		

[a] Cronbach's alpha calculated from the Year 1 patient assessment questionnaire.
[b] Stability over a one-year interval.
[c] Internal consistency reliability cannot be calculated for single-item measures.

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