

# SOCIAL RELATIONSHIPS, RECOVERY FROM ILLNESS, AND SURVIVAL: A LITERATURE REVIEW<sup>1,2</sup>

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## ABSTRACT

*Do medical patients with a high quantity or quality of social relationships have greater chances of recovery and survival than more isolated individuals? This article reviews longitudinal studies of social relationships and recovery published since the last major reviews of this field. Reports of 26 such projects were located, primarily in the areas of heart disease (13 studies) and breast cancer (7 studies). Being married (or socially supported in other ways) was generally associated with survival or freedom from recurrence in multiyear follow-up studies of myocardial infarction (MI) and coronary artery disease patients, although social support produced negative or mixed results in studies of short-term physical adaptation after MI or bypass surgery. Studies relating marital status and other support variables to recurrence and survival in breast cancer patients also had mixed results. The small number of studies, and other limitations associated with them, suggest caution in drawing strong conclusions.*

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## INTRODUCTION

Social support has been linked to lower self-reported depression and physical symptoms, mitigation of stress effects, and even a reduced rate of mortality in various healthy community resident and college student samples (1-6). For example, in a well-known study by Berkman and Syme (7), nearly 5,000 randomly-selected residents of Alameda County, California were assessed on a social network index (based on marital status, contacts with friends and relatives, church membership, and other group memberships) in 1965. After a nine-year follow-up, the most isolated individuals were found to have the highest mortality rates, even controlling for other risk factors. Once an individual has been diagnosed with a serious physical illness, however, is the quantity or quality of that person's social ties predictive of recovery or survival over time? And if so, what forms of social support, acting through what mechanisms, might account for salutary effects in patients?

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Previous reviewers have addressed these issues (8,9) and cited some promising early findings; however, this literature has expanded considerably in roughly the last decade. An examination at this time of the relation between social support and recovery from illness would be valuable for many reasons. First, in prospective studies of healthy individuals that report links between social relationships and mortality, it is usually unknown whether social ties influence disease incidence or affect health after disease onset (10). The present review should help fill in this gap. Second, studies of how medical patients cope with illness show that seeking social support is one of their most common coping techniques (11,12). That patients are prone to seek support makes salient the issue of whether support is beneficial for physical health.

## STUDIES REVIEWED

The present article reviews studies published since 1983, the approximate time of the last major reviews of this field (8,9). Inclusion criteria were as follows: subjects were individuals with a physical illness; naturalistic, non-professional social relationships were assessed; and measurement of psychosocial variables preceded outcomes (i.e. longitudinal studies). Only studies using at least relatively objective measures of physical outcome were included, although some of the outcomes had a psychological component (e.g. those relating to perception of pain). Studies were located on the Medline and PsycLIT databases using the following terms: social support, social environment, social isolation, psychosocial, survival, recovery, and longevity. Also, as each article was read, the references were used to locate additional articles.

## OVERVIEW OF FINDINGS

Results are presented according to the type of illness that was examined. A distinction will become apparent in the social-relationship variables used in the different studies. Some focused on *structural* social support (the existence of relationships such as marriage) and some on *functional* social support (particular supportive behaviors) (2). Although the structural-functional distinction is used to guide much of the review, it is important to acknowledge that the social support concept is far more complicated. These complexities are discussed later in this article. In general, however, studies of structural support can indicate whether the social ties-mortality link in healthy samples is partially accounted for by social ties improving people's recovery prospects after serious illness, whereas studies of functional support have the additional potential to tell us what specifically in people's relationships is having a salutary effect (9).

### Heart Disease

*Studies of Heart Disease Patients Relating Marital Status (and Other Structural Variables) to Recurrence and Mortality Rate:* Six studies attempted to relate marital status and related

factors such as marital disruption and living alone to recurrent events and survival in myocardial infarction (MI) and coronary artery disease (CAD) patients. Four studies showed primarily positive results.

Two studies of MI patients found beneficial effects of being married in terms of lower mortality. Wiklund and colleagues (13) followed 201 men for five years. Chandra and colleagues (14) followed 1,401 individuals for ten years and found significant effects separately for males and females. In both of these studies (and for males and females examined by Chandra et al.), the difference in survival rates between married and unmarried individuals increased with time. Wiklund et al. noted that the effect of social relationships was independent of other risk factors (e.g. severity of the infarction). Chandra et al. also demonstrated, in an analysis of the first three years, that the marital advantage was upheld after adjusting for demographic, health behavior, and clinical indicators (e.g. complications, depth and location of MI). Wiklund et al. also found that marital status did not predict non-fatal reinfarction, but did predict total events (reinfarction or death).

Two recent studies that took a broader social isolation perspective (including marital factors) found salutary effects of social connection. R.B. Williams and colleagues (15) followed a predominantly male sample ( $N = 1,368$ ) with CAD with survival time until cardiovascular death serving as the outcome variable. The median follow-up length was nine years. Subjects were assessed on both a structural support variable (marital status) and qualitative measures (satisfaction with family relations, satisfaction with amount of contact with friends and relatives, presence of a confidant, feelings of loneliness). Married patients survived longer than their unmarried counterparts. Two-way interactions between marital status and each of the qualitative variables also were tested. Only the interaction between marital status and confidant availability was statistically significant; unmarried patients without a confidant ( $N = 35$ ) had a lower survival rate (.50 after five years) than the three other permutations—being married, having a confidant, both (.82). Like others, these investigators controlled for medical variables; they claimed that their direct measure of disease severity exceeded the level of control-variable assessment in other similar studies.

Case and colleagues (16) followed a predominantly male sample ( $N = 1,234$ ) that had experienced MI. Individuals who did and did not live alone at the outset of the study were compared with respect to total recurrent cardiac events (non-fatal infarction or cardiac death) and cardiac deaths alone. Also compared were individuals whose marriages had been disrupted (widowed, divorced, or separated) at the outset and those whose marriages were intact. One might expect a large degree of overlap between individuals with disrupted marriages and those who lived alone; however, nearly half the individuals with disrupted marriages lived with others. Living alone was a significant risk factor for recurrent cardiac events controlling for medical and sociodemographic covariates, but not a risk factor for cardiac deaths. Marital disruption was not a significant predictor of these outcomes. An additional analysis using only individuals with disrupted marriages found that those who lived alone had a significantly higher rate of cardiac events and deaths than those who lived with others.

The remaining two studies of marital status produced primarily negative results. Brackett and Powell (17) conducted a study of predominantly male post-MI patients ( $N = 1,012$ , fol-

low-up = 4.5 years). They found that 14% of individuals experiencing no recurrence were unmarried, not significantly different from the percentage of unmarried persons in the groups experiencing a non-fatal recurrence (13%), sudden cardiac death (13%), and non-sudden cardiac death (16%). Also, a study by Frasure-Smith and Prince had mostly negative findings, but one interesting result [18 (initial report), 19 (follow-up)]. This study was concerned primarily with evaluating a randomized stress-reduction program ( $N =$  approximately 350–450 men over the different years). For the overall sample, marital status was unrelated to cardiac deaths over the first year (during which the program was carried out), but being married was associated with lower out-of-hospital deaths (presumed to be cardiac sudden deaths) over the program year, even when traditional risk factors were controlled statistically. However, this effect was no longer significant when program participation was included in the model, suggesting that marriage may serve a stress reduction function. Marital status showed no relation to MI recurrence through the end of the fourth follow-up year.

One additional study, by Ruberman and colleagues (20), used a rather odd and heterogeneous social support index. It combined a couple of traditional network items (group membership and visitation with friends and relatives) with amount of discussion the patient had with medical personnel about the need for life changes. Nonetheless, high support as gauged by this index was associated with longevity in the sample of male MI survivors ( $N = 2,320$ ). The follow-up interval was three years. Multivariate analyses controlling for other risk factors examined social isolation only in interaction with life stress—individuals high in both isolation and stress were much more likely to die than individuals low in both.

*Studies of Heart Disease, Particular Types of Social Support, and Short-Term Physical Adaptation:* Six projects were concerned with the shorter-term physical adaptation of patients experiencing MI or undergoing coronary bypass surgery. These studies tended to measure social support in greater detail than the ones reviewed above, but had shorter follow-up intervals (a few days to approximately one year) and smaller samples ( $N$ 's = 60–155, predominantly males). The results from these studies were either mixed or negative.

Fontana and colleagues (21) conducted a four-wave panel study with MI and bypass patients relating perceived support (reverse scores on the UCLA Loneliness Scale; 22) to dyspnea (difficult or painful breathing) and angina (a scoring method was adapted from 23; the highest score reflected rehospitalization for that symptom). Assessment times were during hospitalization, and three, six, and twelve months following discharge. The associations between in-hospital support and three-month dyspnea and between three-month support and six-month dyspnea were significant and indicated that support was beneficial. The link from six-month support to twelve-month dyspnea and all corresponding paths to angina were non-significant.

King and colleagues (24) conducted a similar study with bypass surgery patients, in which five types of social support were used to predict angina and disruption of activities. Assessments occurred prior to the operation and at one, four, and twelve months afterward. Four-month social support (the five subscales as a set) predicted fewer activity disruptions at one year postsurgery, controlling for disruptions at four months. Esteem and tangible support appeared to be the main contributors to this protective effect. Similar multiple regression equa-

tions for activity disruptions at other times and those for angina did not achieve statistical significance.

Kulik and Mahler (25,26) conducted two studies of bypass surgery patients. In the first (25), they directly monitored the number of spouse visits to patients as one measure of social support. Highly-visited married patients required the lowest levels of pain medication. However, on the measures of time in the surgical intensive care unit and in the hospital, although the highly-visited married patients were released faster than their rarely-visited married counterparts, neither group differed from a group of unmarried patients (all low in visits). Visitation had no effect on ambulation on the fourth, fifth, and sixth post-operative days. A patient rating of marital quality showed no effect, but this may have been due to a lack of variability (71.4% answered "excellent"). Kulik and Mahler's second study (26) attempted to relate marital status and emotional support to cardiac health 13 months after hospital release. (Psychosocial assessments occurred at 1, 4, and 13 months after release; many of the subjects in this second study had also participated in the earlier one on spouse visitation.) Longitudinal analyses failed to link the support-related variables to indicators of cardiac health (number of angina episodes, number of physician visits for heart problems excluding regular check-ups). Adherence to recommended behaviors (smoking cessation, increased walking for exercise) was also unrelated to support in longitudinal analyses. (Adherence as a possible mediator of social support and recovery is taken up in the Discussion.)

Helgeson (27) assessed three types of social support in MI patients shortly before hospital discharge: (a) presence or absence of a confidant aside from one's spouse (28); (b) degree to which the patient felt he or she could really talk to the spouse about important things (called the "spouse disclosure" variable); and (c) a social contact/group participation instrument (29). At one year's follow-up, ability to disclose to one's spouse was negatively related to being rehospitalized and amount of chest pain. Control variables in these analyses included MI severity and initial psychological distress. A further analysis revealed that married patients high in disclosure ability and unmarried patients low in disclosure ability had a much higher rehospitalization rate. No significant results were obtained for the other two types of social support.

Finally, two studies used the New York Heart Association (30) degree of limitation measure as the outcome variable. Ell and Haywood (31) assessed a wide variety of social relationship attributes (e.g. network size, emotional support, advice from others) in MI patients during the course of a year, whereas Rankin and Monahan (32) assessed perceived social support in cardiac surgery patients in a three-month study. Results were negative in these two studies.

## Cancer

*Breast Cancer:* Vernon and Jackson (33) have reviewed the role of social support in survival from breast cancer. The present section discusses many of the same studies as Vernon and Jackson, but also includes a few studies that they did not include (34-39). Studies relating marital status and other support variables to recurrence and survival in breast cancer patients have produced mixed results. Neale and colleagues (40) compared samples of 910 married and 351 widowed women and found a greater survival rate over a ten-year period for the married group, with the discrepancy increasing over time. The greater

ten-year survival for married women remained after adjusting for age, socioeconomic status, delay in seeking treatment, and stage of disease at diagnosis (there were no differences between married and widowed patients in either stage or delay). Le-Marchand and colleagues (37), following a sample of 2,956 women for five years, found no mortality differences between married and unmarried (single, widowed, separated, and divorced) individuals, however. Funch and Marshall (41), following a sample of 208 women for 20 years, found no differences in months survived according to marital status or number of relatives and friends. They did find a beneficial effect of organizational involvement, adjusting for stage and amount of experienced stress. (See also 42 for additional analyses.) Dean and Surtees (35), who followed 121 women for six to eight years, found no relationship of marital status to either recurrence or death.

Horn and colleagues (36) compared 338 women who had been diagnosed with a second primary breast cancer with women who had a first breast cancer but not a second (336 women were in a matched control group, 338 in a randomly-selected control group). They found a significant interaction between age at initial cancer diagnosis and marital status: never having been married was associated with a decreased risk of second cancer among younger women (<40 years), but with an increased risk among older women (>65). This was significant only in the comparison with the unmatched control group. These authors, however, interpreted marital status as a proxy for reproductive history, rather than in psychological terms. In light of the possible confounding of marital status and biological factors, caution should be exercised in interpreting results involving marital status.

Researchers in Vancouver, Canada reported the results of a single project in a pair of articles (39,43). These authors followed 118 women for four years. The earlier article (43) reported an association between engaging in expressive activities at home and a lower instantaneous relative death rate (IRDR). In the later article (39), the authors added a number of social network variables (7) to an equation predicting IRDR. The effect of activity participation was no longer significant. Many of the new social network variables related to death rate, but not always in the expected direction. Number of supportive friends was positively related to survival, but when one's overall network (marital status, contact with friends and relatives, church membership) was considered, those with a medium-sized network had the greatest survival and those with a large network had the poorest. Also, unmarried individuals had greater survival than their married counterparts.

Levy and colleagues (38;  $N = 81$ ) attempted to relate respondents' perceived family support to whether they had experienced a recurrence at the five-year follow-up. Social support did not show such a predictive relationship. Among those experiencing a recurrence, however, greater support was associated with a longer time to recurrence.

Finally, two studies investigated people with many different forms of cancer, including breast cancer. Relevant parts of these studies are discussed either in the present section on breast cancer or in the next section on other forms of cancer. In the largest study included here, Goodwin and colleagues (44) assessed outcomes for 25,706 adults with over a dozen forms of cancer. Contrary to the finding for the overall sample, the relative risk of death was not significantly different for married and unmarried breast cancer patients. This result was obtained adjusting for stage at diagnosis and receipt of treatment, how-

ever, and the married breast cancer patients were more likely to have had localized disease and to have received treatment.

Cassileth and colleagues (34,45) also studied patients with different types of cancer. Breast cancer and melanoma patients were combined into a group (Group II), for which social relationship variables were used to predict occurrence of/time to relapse. There were no significant effects (for greater detail, see below).

*Other Forms of Cancer:* This section includes three projects examining multiple forms of cancer [including studies done by the Goodwin (44) and Cassileth (34,45) teams], one concentrating on lung cancer patients (46), and one concentrating on patients with hematologic malignancies (47).

Goodwin et al. (44) found for their overall sample that married individuals were more likely than their unmarried counterparts to have had their cancer diagnosed at the local stage (i.e. detected earlier), and to have received treatment (controlling for degree of spread or stage). However, even after adjusting for stage and treatment, married individuals still had a lower risk of death.

In their original report, Cassileth et al. (45) followed one set of patients (Group I,  $N = 204$ , consisting of pancreatic, gastric, lung, and colorectal cancers, and glioma) for survival time, and followed another set of patients (Group II,  $N = 155$ , consisting of melanoma and breast cancer) for time to relapse, with marital status and social network variables (7) used as predictors. At the five-year follow-up, there were no significant effects. Cassileth et al. (34) presented further results on their original samples, thus extending the follow-up interval to as long as eight years after diagnosis. In Group I, only 6% of the original subjects were still alive, so analyses predicting survival must be interpreted with caution. Unmarried individuals were more likely to be alive than their married counterparts. Social ties showed a salutary effect on survival, but only when coded as high versus low or mid. In Group II, neither marital status nor social ties showed any significant effects.

Reynolds and G.A. Kaplan (48) studied individuals in the Alameda County study who had developed cancer ( $N = 339$ ), assessing the association between social relationships as assessed in 1965 and survival time over a 17-year follow-up. Men scoring as least connected on the social network index had a poorer prognosis than their more connected counterparts; results were adjusted for age at diagnosis and stage of disease. There were no effects for women.

Stavraky and colleagues (46) examined both need for and supply of social support, as well as the fit between them, in attempting to predict survival among 224 lung cancer patients. After one year, there were no significant effects of supply of support or of fit of supply to need; marital status had no effect either. Despite this negative finding, studying levels of social support in relation to an individual's need for it is considered to be an important area for future research (49,50).

Finally, Richardson and colleagues (47) studied 94 patients with hematologic malignancies. Their primary purpose was to evaluate an intervention program designed to improve compliance with treatment. However, they also compared the survival of patients who did and did not live alone (follow-up = 2–5 years). There was no significant effect of living alone.

### End-Stage Renal Disease

Devins and colleagues (51) attempted to relate marital status, social network attributes (7), and number of leisure activities

to the proportion of time over a 46-month follow-up that an individual end-stage renal disease (ESRD) patient remained alive ( $N = 97$ ). Numerous psychosocial variables (e.g. depression, perceived control, in addition to social relationship indices) were assessed twice in interviews conducted six weeks apart, so that the data could be aggregated to enhance reliability. Number of leisure activities predicted survival time in a regression model controlling for number of serious comorbid non-renal illnesses, age, and life happiness. Social networks and marital status were not related to survival time.

### DISCUSSION

One area in which social support research has expanded in recent years is that of recovery and survival from physical illness. Although the number of available studies is not extremely large, some preliminary observations can be made regarding the conditions under which social relationships may be most beneficial for health. The strongest findings in the present review were for structural support (primarily being married) predicting survival or freedom from recurrence in MI and CAD patients. Other reports also point to the benefits of being married. A recent review article on marital factors and health by Burman and Margolin (52), which cited some of the same studies as cited herein, also suggests that being married is negatively related to mortality among individuals with illnesses. Though not included in the formal review, a study of daily self-reported health in formerly hospitalized older individuals provides further convergent evidence: married respondents reported better health (53). Studies in the present review with positive findings also tended to have large samples and extended follow-up intervals. Also, the subjects were predominantly male, which fits with the finding that men are more likely to derive other health benefits from marriage and other structural supports than women (54,55). Although we have an idea of what type of study might be conducive to detecting an effect, due to the structural nature of the support measures we still do not know what aspect of people's social relationships is enhancing health (9).

Greater understanding of how social relationships affect recovery from illness awaits at least two developments: consistent demonstration of associations between specifiable aspects of relationships and recovery, and verification of mechanisms underlying such associations (9,56). Future progress in these areas might be facilitated by attention to several practical and conceptual issues.

### Measurement Issues

The study of specific functional aspects of social support (e.g. practical advice, emotional comforting) may have been hampered by the questionable reliability and validity of some of the instruments used in the studies. Several new social support measures have been developed; critical reviews of existing measures are available (6,57). Several subtleties involving functional support must also be carefully considered by researchers. Some measures assess how available respondents perceive social support to be, whereas others assess support that has actually been received. The two are not highly correlated (49), and so an investigator must keep in mind the particular goals of a study in selecting an instrument to use. Negative aspects of interpersonal relationships should also be considered. Behaviors intended to be supportive may be perceived by recipients as unwanted or unneeded, which can increase recipients' distress (58). Also, features of one's social relationships may interfere with adherence to medical regimens (see below).

The time of assessment may also be an important factor. Many of the reviewed studies measured social support within days or weeks of illness diagnosis or treatment, or hospital discharge. In the highly emotional context of serious illness, an individual's rating of satisfaction with one's spouse, for example, may be biased relative to responses that would be given in calmer moments (see 25,39,52 for related discussions). Any measurement error of this sort could obscure relations between support and recovery. If a researcher wanted to know how an individual's long-standing preillness social relationships predicted recovery from a later illness, an enormous sample of healthy people would be required so that the fraction of people who developed a certain type of illness could be followed over a long period of time. This was done for the Alameda County sample with regard to cancer (48), but for most researchers such a study would appear prohibitively costly.

Assessment of support shortly after illness onset may actually be quite appropriate, according to one line of research. Studies have shown that after an individual becomes ill, he or she often receives less (or less helpful) support than expected because potential providers may feel awkward, vulnerable, or helpless (9,49). In a sense, then, assessments of support shortly after illness onset may provide a true reflection of how a patient's support network actually responds to crisis. Whatever the timing, though, one would probably not want to rely on a single assessment of support (or other psychosocial variables), as it will almost certainly change in quantity and quality over time (e.g. 8,9,21,39,56,59,60). Devins et al. (51) obtained psychosocial data twice from each subject, six weeks apart, and then summed the two assessments to enhance reliability; as noted above, they obtained promising results.

### Mechanisms

Investigation of mechanisms also remains as an extremely important task. Although many mechanisms are possible (e.g. 3,10,55,61), four that have been researched and commented upon in the literature are discussed here. These mechanisms are drawn from both the specific literature on social ties and recovery from illness and the more general one on social support and health (i.e. including studies of healthy people).

First, social support may facilitate obtaining medical treatment for persons with illness. Chandra et al. (14) suggested that a spouse can help obtain treatment for a person experiencing MI. Goodwin et al.'s (44) cancer research supports the idea that being married facilitates treatment, but being married was associated with survival in this study even after adjusting for this factor. Something beyond medical care thus appears to be contributing to the marital status-survival relation, at least in certain samples of cancer patients. Ruberman (62) has also argued against interpretations based on medical care in studies of sociological variables and mortality.

Second, other people can influence an individual's health-related behaviors. Health-related behaviors include many practices such as smoking cigarettes or engaging in physical exercise. The behavior of greatest direct relevance to recovery from illness, however, would probably be adherence to medical regimens. A review of early (pre-1983) studies (8) suggested that social support is associated with adherence, although contradictory results were present. More recent reviews (50,63) have also found social relationship factors to play a role in adherence, although warnings about potential negative interpersonal influences have also been voiced (50). R.M. Kaplan and Toshima

(64) have provided a thorough review of both positive and negative social influence processes in relation to individuals with chronic illnesses. In one illustrative study, social support from significant others (spouse, friends, people at work) showed some positive associations with remaining in treatment for hypertension (65). In another study, however, social network size (for women) and satisfaction with support (for men) were related to poor management of Type II diabetes (66), which the investigators attributed to social obligations imposed by networks and negative norms tolerant of unhealthy lifestyles (positive effects of social support were also obtained in this study). Finally, results have been mixed in studies of more general health-related behaviors. In addition to Kulik and Mahler's (26) negative results for smoking and exercise that were presented earlier, a study of male smokers who underwent non-cardiac surgery (67) found that marital status was unrelated to resumption of smoking at one year's follow-up. Finnegan and Suler (68), however, found partial support for the idea that social support promotes salutary change in areas such as weight loss, smoking, and exercise in coronary patients.

The third and fourth mechanisms involve the effects of social contact on physiological processes. One mechanism focuses on expressive behavior. According to Pennebaker (69), holding back one's thoughts and feelings about emotionally traumatic events (such as may accompany onset of a serious medical condition) is physiological work, which can compromise health through its effects on, for example, autonomic nervous system and immunological functioning. His studies have found that inducing individuals to disclose trauma-related thoughts and feelings can have salutary effects including improved immune functioning. Helgeson (27) also found disclosure to be important for cardiovascular health.

It may also be the case that the mere presence of another person can have a calming effect on the individual (3). In a laboratory study by Kamarck and colleagues (70), there was some evidence that cardiovascular reactivity (elevations in blood pressure and heart rate above baseline in response to stress or challenge) was attenuated when subjects were accompanied by a friend. Many other studies have sought to uncover links between social-psychological factors (e.g. marital quality, loneliness, stress) and cardiovascular and immunological changes (56,71-73). Questions remain, however, about whether physiological changes studied in relation to stress and social support have major implications for long-term health. Studies attempting to establish cardiovascular reactivity as an independent, prospective risk factor for coronary heart disease and hypertension are few and have produced mixed results at best (74-76). Also, variations in immune response have not yet been directly linked to development or severity of illness; indeed, persons under stress often have immune responses within normal ranges (52,71,72,77). However, stress-induced physiological changes may be most likely to have serious health consequences in people who are already ill (e.g. 72).

### Future Research

This final section sketches a more concrete set of guidelines for future research to resolve some of the unanswered issues in the study of social relationships and recovery from illness. First, multiyear studies with large samples are recommended. Studies of one year or less may not allow enough time for behavioral and physiological processes to influence health, or for sufficient variability on the outcome measures to emerge (26). Three stud-

ies with five- to ten-year follow-ups (13,14,40) not only found greater survival in married patients than in their unmarried counterparts, but also that the survival discrepancy increased with time. Learning whether married and unmarried individuals (or other groups high and low in social support) exhibit corresponding differences over time on possible mediating variables (e.g. adherence, physiological changes) would be valuable. Longitudinal studies could thus be used to test whether structural and functional support at various points after illness onset predict later levels of mediating variables, which then predict later health. Such a design would require that the intensive measurement schedules used in many short-term studies be adopted in longer investigations. For example, in a five-year study, assessments of social support, adherence behaviors, and physiological indicators could be obtained every six months.

Ideally, a researcher would attempt to test the different mechanisms (access to treatment, adherence, emotional expression, reactivity, or any other ones) within the same study. Interrelationships among these mechanisms could then be discovered; for example, an individual lacking the calming influence of a supportive other might be less likely to adhere to the treatment regimen or express his or her emotions. Whatever mechanisms an investigator chooses to study, they should be carefully matched to the support measures being used (e.g. if emotional expression's effect on the immune system is the mechanism proposed, it is important to have reliable and valid measures of ability to disclose).

Another option for researchers would be to devise a randomized intervention program to influence some aspect of recovery. Regular postintervention assessments of variables hypothesized to relate to the recovery process would help reveal mechanisms of improvement in health. Richardson and colleagues (47) found that their program had the intended effect of increasing cancer patients' compliance, which then influenced survival (program participation was also independently related to survival). Teams led by Fawzy (78) and Spiegel (79) have also shown that group psychiatric therapy sessions can have beneficial health effects. Actual implementation of the above ideas would obviously be quite expensive, but it is hoped that these suggestions will at least stimulate researchers to think in terms of causal processes and about ways to test them empirically.

In conclusion, there is some evidence that social relationship influences on recovery and survival contribute in part to the overall social relationships-mortality link. As research on social relationships and health proceeds, we will be better able to draw firm conclusions that might lead to greater theoretical understanding of stress, coping, and disease processes and possible clinical applications.

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