

Social Network Characteristics and Onset of ADL Disability: MacArthur Studies of Successful Aging

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The relationship between social network structural and support characteristics and onset of new or recurrent activities of daily living (ADL) disability was examined in a cohort of older men and women. No significant protective effects were found for network structural or support characteristics. However, greater frequency of instrumental support was associated with significantly increased risk of ADL disability among men; a similar though nonsignificant pattern was seen among women. These findings indicate that receipt of more instrumental support may not have uniformly beneficial effects on functional status. They serve to underscore the need for more comprehensive research, examining both the positive and negative effects of social interactions on health and functioning.

WITH the ongoing and rapid growth of the oldest segments of the population and the increased rates of disability in these older age groups, there is considerable interest in identifying factors that influence the onset of disability, particularly more serious disability affecting activities of daily living (ADLs). Identification of risk-enhancing and risk-reducing factors can help to target areas for interventions to prevent or postpone such disability with its attendant effects on both quality of life and utilization of health care resources. This study examines the impact of social network structural and support characteristics on the risk of onset of new or recurrent ADL disability in a cohort of older men and women aged 70–79.

Over the past two decades, there has been a resurgence of interest in the impact of individuals' social networks on their health and daily functioning (for reviews see Broadhead et al., 1983; House, Landis, and Umberson, 1988). The vast majority of this research has focused on the hypothesized benefits of social ties and, in particular, the postulated benefits of the emotional and instrumental support such ties provide (Cohen and Syme, 1985; Sarason and Sarason, 1985). However, as social exchange theorists (Blau, 1964; Thibaut and Kelley, 1959) and others (Duck, 1982; Wellman, 1985; Wellman and Hall, 1985) have long argued, social relationships are frequently characterized by costs as well as benefits. Such costs can take the form of requests/demands for assistance, criticism, or other forms of interpersonal conflict (Averill, 1982; Kessler, McLeod, and Wethington, 1985; Morgan, 1989). Unfortunately, this dual nature of social relationships, most specifically their potential costs, has generally been ignored in studies of social ties and health.

Research examining relationships between social ties and physical functioning has largely focused on the positive or protective effects of network structural characteristics (e.g., network size, marital status). Marital status, for example, has been identified as a protective factor in some (Mor et al.,

1989; Palmore, Nowlin, and Wang, 1985) but not all (Roos and Havens, 1991) studies of physical functioning. Measures of social network size have more consistently indicated a protective effect with respect to physical disability (e.g., Boulton et al., 1994; Kaplan et al., 1993; Sugisawa, Liang, and Liu, 1994). Indirect evidence of the role of social ties in the etiology of physical disability is also suggested by evidence of protective effects of social ties with respect to two important outcomes of disability: institutionalization and mortality (Bowling and Salvage, 1984; Freedman et al., 1994; Steinbach, 1992; Wolinsky et al., 1992).

The influence of more functional aspects of social relationships represented by such social ties has received considerably less attention. The research that has been done has focused primarily on the emotional rather than instrumental support characteristics of networks. Greater emotional support (e.g., having people to talk with about problems and/or to cheer you up) has been found to have a positive effect on recovery post-stroke, both in terms of physical and social functioning (Friedland and McColl, 1987; Glass and Maddox, 1992; McLeroy et al., 1984) while lack of such emotional support has been found to predict greater mortality post-myocardial infarction (Berkman, Leo-Summers, and Horwitz, 1992). In addition, data from the MacArthur Study of Successful Aging indicate beneficial effects of emotional support on physical capacity, though interestingly, this effect is strongest among those reporting little or no instrumental support from their social network (Seeman et al., 1995).

A smaller number of studies, however, have also indicated that social support may not be uniformly beneficial. Even seemingly positive aspects of social relationships such as increased levels of instrumental and/or emotional support have been found to exert negative effects on psychological functioning (Brickman et al., 1982; Peters-Golden, 1982; Revenson et al., 1991; Wishnie, Hackett, and Cassem, 1971) and physical functioning (DiMatteo and Hays, 1981; Garrity, 1973; Hyman, 1971; Lewis, 1966). These effects appear to

be most likely in cases where the support provided is unwanted or does not match or meet the recipient's needs (Peters-Golden, 1982; Revenson et al., 1991; see also Brickman et al., 1982; Cohen and McKay, 1984; Stewart, 1989; Wortman and Conway, 1985, for reviews). With respect to physical functioning specifically, the data come primarily from longitudinal studies of adaptations to chronic physical illness such as congestive heart failure or myocardial infarction. Studies following patients from 4–12 months after their initial diagnosis have shown that reports of greater social support in terms of preferential treatment from others and “overprotectiveness” are associated with greater reported disability to various life domains, including work, household, and leisure activity (Garritty, 1973; Hyman, 1971; Klein et al., 1965; Lewis, 1966). A similar pattern of effects was also found in a longitudinal study of diabetics where men with larger support networks were found to exhibit worse control of their diabetes (e.g., significant increases in glycosylated hemoglobin, cholesterol, and triglycerides, and similar trends for glucose and weight) at 18-month follow-up (Kaplan and Hartwell, 1987). Research on nursing home residents also suggests that greater instrumental support in the form of assistance and care from staff is not uniformly beneficial as both psychological and physical functioning were enhanced when individuals are given a larger role in caring for themselves (Langer and Rodin, 1976).

In this study, we used longitudinal, community-based data from the MacArthur Successful Aging Study to examine the effects of social network structure as well as the effects of both emotional and instrumental support characteristics on the risk of onset of new or recurrent disability in ADLs. As indicated earlier, such disability is of particular interest as it has been linked to greater risk of institutionalization and mortality as well as greater use of health care resources, reduced “quality of life,” and depression (Bruce and Hoff, 1994; Friedland and McColl, 1987; Katz et al., 1963; Turner and Noh, 1988). The MacArthur data offer a number of advantages for these analyses. First, the sample was drawn from population-based cohorts and reflects substantial socioeconomic and racial diversity. Second, the selection criteria for this study resulted in a baseline cohort of relatively high functioning older men and women. Such a cohort is advantageous for our purposes since the lack of prevalent disability at baseline in this cohort aids in interpretation of the causal relationships among psychological and social predictors of *onset* of new or recurrent physical disability. The availability of a relatively high functioning, disability-free sample enables us to examine the effects of such factors on subsequent onset of new or recurrent physical disability, free of possible confounding with poor baseline physical functioning. Despite the selection criteria, the resulting cohort does not represent only an elite subgroup of the older population. Rather, it represents approximately the top third of the population aged 70–79 in terms of physical and cognitive functioning and exhibits considerable intra-cohort heterogeneity in both domains of functioning (e.g., see Berkman et al., 1993; Inouye et al., 1993; Seeman et al., 1993, 1994b). Third, quite apart from respondents' reports of physical disability or limitations, our assessment of respondents' actual physical performance abilities allows for

more rigorous control of the possible confounding effects of baseline physical functioning, over and above self-reports of difficulties in physical functioning. And fourth, as indicated, the MacArthur battery included extensive measurement of both the structural and functional characteristics of participants' social networks, providing an opportunity to examine their relative contributions to the risk of ADL disability.

METHODS

Data for these analyses come from the MacArthur Community Study, a longitudinal study of relatively high functioning men and women aged 70–79. As described in greater detail elsewhere (Berkman et al., 1993), subjects were subsampled on the basis of age and both physical and cognitive functioning from three community-based cohorts of the National Institute on Aging's Established Populations for Epidemiologic Studies of the Elderly (EPESE) in Durham, North Carolina, East Boston, Massachusetts, and New Haven, Connecticut (Cornoni-Huntley et al., 1986). Age was restricted to 70–79 years in order to minimize the effects of age on subsequent analyses of factors associated with the maintenance of better health and functioning.

Age-eligible men and women ($N = 4,030$) were screened on the basis of four criteria of physical functioning and two criteria of cognitive functioning to identify those functioning in the top third of the age group. The selection criteria included: (a) no reported disability on the 7-item Activities of Daily Living (ADL) scale (Katz et al., 1963); (b) no more than one reported mild disability on 8 items tapping gross mobility and range of motion (Nagi, 1976; Rosow and Breslau, 1966); (c) ability to hold a semi-tandem balance for at least 10 seconds; (d) ability to stand from a seated position 5 times within 20 seconds; (e) scores of 6 or more correct on the 9-item Short Portable Mental Status Questionnaire (Pfeiffer, 1975); and (f) ability to remember 3 or more of 6 elements on a delayed recall of a short story.

Of the 4,030 age-eligible men and women, a cohort of 1,313 subjects met all screening criteria and were eligible for enrollment in the MacArthur study; 1,189 (90.6%) agreed to participate and provided informed consent. Baseline data collection was completed between May 1988 and December 1989 and included a 90-minute face-to-face interview covering detailed assessments of physical performance as well as measures of cognitive performance, health status, and social and psychological characteristics. The cohort was reinterviewed beginning in May 1991. A majority of the cohort was reinterviewed between 24 and 32 months after their baseline interview (mean = 28 months, $SD = 4$ months). Attrition from the baseline cohort was minimal: 59 (5%) partial or proxy interviews, 47 (4%) refusals at follow-up, and 71 (6%) deaths.

Activities of daily living disability. — The outcome measure for this study was self-reported physical disability at follow-up as assessed by the 7-item ADL scale (Katz et al., 1963). Because the eligibility criteria ensured that everyone in the sample started the study without any reported ADLs, reported disabilities at the follow-up interview are considered onset ADL disabilities. Because respondents may have had ADL disabilities in the past from which they had

recovered by the first interview, these onset disabilities may include both new and recurrent onsets. Available data from prior NIA-EPESE interviews for the New Haven and East Boston subjects, covering the period 1982 through 1988 (our baseline), indicate that recurrences represent 21% of the reported onsets between 1988 and 1991 for men and 25% of the onsets for women.

Social network characteristics. — The MacArthur battery included assessments of respondents' social networks, including network structural characteristics and support characteristics. Measures of network structural characteristics included marital status, number of close ties with children, number of close relatives, number of close friends, total network size (i.e., sum of ties with children, friends and relatives), and number of visual contacts with children, friends and relatives (range = 0–10 in all cases except marital status, which was coded 0–1). Measures of network support included frequency of both emotional support and instrumental support. More negative aspects of social interaction were also measured in terms of the frequency of criticism and excessive demands. Summary measures were developed based on subjects' responses to a series of items (asked separately for three categories of social ties: spouse, children, and close friends and relatives). These items ask how often individuals in each of these categories engage in various types of behavior vis-à-vis the respondent (e.g., "How often do your children . . ."). Four Likert-type answer categories were available for each item (coded 0–3; never, rarely, sometimes, or frequently).

Emotional support was measured based on the reported frequency with which each type of tie "will listen when you have a problem" and/or makes the respondent "feel loved and cared for" (2 items asked for each of 3 categories of ties; 6 items total). *Instrumental support* was measured based on the reported frequency with which network members "help with daily tasks" and "provide information" (6 items). *Demands/criticism* were measured through items asking how frequently spouse, children, and close friends and relatives were "too demanding" and/or "too critical" (6 items). Two types of summary measures were constructed for each of these domains (i.e., 2 for emotional support, 2 for instrumental support, and 2 for demands/criticism). One version reflects the *average* frequency that a given type of support or conflict was experienced, averaging across the various possible sources (i.e., spouse, children, and close friends/relatives); the second summary score measures the *maximum* frequency reported (i.e., the maximum frequency from any one of the possible sources).

The various summary scales show reasonable two-month, test-retest correlations (e.g., .86 for number of ties, .73 for average emotional support, and .80 for demands/criticism). Only average instrumental support shows lower test-retest stability ($r = .44$). The Spearman rank correlation for instrumental support, however, is somewhat higher ($r = .55$), suggesting that individuals' relative ranks are more stable than their actual levels of reported support. Additional details regarding development of these scales have been reported elsewhere (Seeman et al., 1994a).

Covariates. — Covariates were selected for inclusion in the multivariable models based on earlier analyses which had indicated that they were potential confounders, showing an association ($p \leq .10$) with risk of ADL disability (Bruce et al., 1994). Sociodemographic characteristics included only age. Analyses were stratified by gender, and neither race, income, nor education was found to be associated with risk of ADL disability. Baseline biomedical, health status, cognitive, and physical performance measures included baseline systolic blood pressure, body mass index (kg/m^2), self-reported prevalence of chronic metabolic conditions (cancer and diabetes), depressive symptomatology, and summary measures of both cognitive and physical performance. Each of these latter two measures is based on subjects' performance on a series of tests covering a range of difficulty. Cognitive performance was measured by summing scores on tests of naming, memory, abstraction, and spatial ability (range = 0–89) (see Inouye et al., 1993, for additional details on scale construction and psychometric properties). Physical performance ability was assessed by summing scores on tests of balance, gait, leg strength, and manual dexterity (range = 0–5). This summary scale has demonstrated good reliability and validity in previous analyses (see Seeman et al., 1994b, for additional details). Self-reports of physical limitations were measured by a summary score reflecting the number of reported problems with gross mobility, based on three items from work by Rosow and Breslau (1966), and five items on range of motion difficulties, based on work by Nagi (1976). A summary measure was created, reflecting the number of reported problems across these eight items. This measure was used as one of the selection criteria for the study such that only subjects reporting zero or one problem were eligible for the study. Thus, the range of values is restricted to 0 or 1 for these analyses where we are using the subjects' baseline scores. An indicator of depressive symptomatology at baseline was generated by averaging scores on the 11 items which comprise the depression subscale of the Hopkins Symptom Checklist (SCL-90) (Derogatis et al., 1974); scores ranged from (1) indicating absence of symptoms to (4) indicating high frequency of symptoms.

Health status measures considered but not found to relate to onset of disability either as main effect or in interaction with social network/support measures included: (a) self-reported coronary heart disease (i.e., stroke, myocardial infarction, angina, high blood pressure) or musculoskeletal disorders (i.e., broken hip or other bones); (b) peak expiratory flow rate (Cook et al., 1991); and (c) measured diastolic blood pressure.

Analysis. — Logistic regression models were run using SAS 6.04 (SAS Institute, 1990) to examine the associations between hypothesized risk factors and onset of new or recurrent ADL disability. Only subjects with follow-up (1991) ADL data could be included in these analyses. Analysis of variance models and chi-square tests were used to compare subjects included in the analyses ($N = 1,031$) to those excluded due to death ($n = 70$) or incomplete 1991 data (due to refusal, partial or proxy interview or missing

covariate data; $n = 88$). As shown in Table 1, subjects included in the analyses were, as one might expect given the longitudinal nature of the required data, more likely to be female, have higher incomes and somewhat higher baseline physical and cognitive performance scores; they also tended to have larger networks, more visual contacts, and more frequent emotional support.

All analyses were examined for men and women separately because previous analyses of this cohort have shown significant gender differences in associations between social network and support characteristics and physiological outcomes (Seeman et al., 1994a) as well as physical performance outcomes (Seeman et al., 1995). Previous research in other cohorts has also shown gender differences in associations between social network characteristics and mortality (House, Robbins, and Metzner, 1982; Kaplan et al., 1988), suggesting that there may be gender differences in the health effects of social networks. Gender differences in baseline characteristics were examined using chi-square tests for categorical variables and t -tests for continuous variables. Analyses of network and support variables began with separate gender-specific, bivariate models for each network and

support measure. Next, we examined separate, multivariate models for each of the social network and support measures (i.e., models that included one network or support variable plus our sociodemographic and health status covariates). Measures that reached a level of significance of $p \leq .10$ (for either men or women) in these latter models were retained for a final, combined model which included all of the significant network measures plus covariates. The sole exceptions were the two measures of physical ability (i.e., the summary measure of physical performance plus the dichotomous indicator for any Rosow-Breslau or Nagi disability) which were retained in all models, regardless of significance level in order to provide full control for baseline reports of physical limitations as well as actual physical performance abilities. This final model provides estimates of the independent associations of these different network characteristics with the risk of ADL disability, controlling for associations among the various network measures as well as possible confounding with sociodemographic or health status variables. Possible interactions between social network characteristics and prevalent health conditions were also tested; no significant interactions were found.

Table 1. Comparisons of Sociodemographic, Health Status, and Psychosocial Characteristics of Subjects Included in the Analyses to Deceased Subjects and Subjects Without Complete Data^a

	Included in Analyses ($N = 1031$)	Died ($n = 70$)	No Covariates or No Outcome ($n = 88$)
Katz Disability 1991 (% Yes)	4.8	—	2.7
Network Structural Characteristics ^b			
Network size (0–30)	10.0	9.2	8.2**
No. close ties with children (0–10)	2.1	2.3	2.1
No. close relatives (0–10)	3.6	2.6**	2.9*
No. close friends (0–10)	4.3	4.3	3.4**
No. visual contacts (0–24)	7.7	7.1	5.8***
Married (% Yes)	47.5%	48.6%	44.2%
Network Functional Characteristics ^b			
Average frequency of instrumental support (0–3)	1.6	1.7	1.6
Maximum frequency of instrumental support (0–3)	2.1	2.2	2.1
Average frequency of emotional support (0–3)	2.5	2.3*	2.4
Maximum frequency of emotional support (0–3)	2.7	2.6	2.6*
Average frequency of demands and criticism (0–3)	.6	.6	.6
Maximum frequency of demands and criticism (0–3)	1.0	1.0	.9
Covariates ^b			
Age in 1988 (70–80)	74.2	74.6	74.5
Male (%)	43.1%	70.0%***	42.0%
Race (% White)	81.0%	84.3%	80.5%
Education (years completed) (0–17)	10.6	10.7	10.1
Income (% < \$10,000/year)	40.4%	42.9%	44.3%*
Systolic blood pressure (mmHg) (85–213)	137.9	135.8	134.6
Body mass index (14.5–43.9)	26.1	25.2	26.3
Metabolic disease (% Yes)	29.5%	31.4%	24.1%
Disability 1988: (% Yes) (Rosow or Nagi)	25.0%	28.6%	26.1%
Physical performance 1988 (0.5–3.9)	2.8	2.6**	2.6*
Cognitive performance 1988 (20–80)	53.2	52.4	49.5***
Depression (1–2.9)	1.3	1.3	1.3

^aMeans or percentages.

^bRanges indicated in parentheses.

* $p < .05$; ** $p < .01$; *** $p < .001$.

RESULTS

Descriptive data for the men and women are presented in Table 2. Men reported having larger networks, more visual contacts with network members, and were more likely to be married than women. Men also reported higher "maximum" frequency of instrumental support from their network and greater reported frequency of demands and criticism. The women reported greater average and "maximum" frequency of emotional support. There were no gender differences in measured systolic blood pressure, relative weight (i.e., body mass index), or depressive symptomatology and no differences in the prevalence of metabolic disease. Women were somewhat older and had lower incomes. They were also more likely to self-report mild disability as measured by the Rosow-Breslau and Nagi items and did worse on the physical performance tests.

For the sample as a whole, 4.8 percent ($n = 49$) reported onset of new or recurrent ADL disability at follow-up in 1991. Of these, 51 percent ($n = 25$) were men, for a rate of onset ADL of 6 percent among the men ($n = 25/444$) versus a rate of 4 percent among the women ($n = 24/587$).

Social network structural characteristics. — Among the men, those reporting more close ties with children experienced greater ADL disability (see Table 3). However, the measure of ties with children exhibited a fairly skewed distribution (range 0–10+) with only nine men and eight women reporting 10+ ties; these latter individuals all repre-

sented cases where subjects reported raising foster children and/or other relatives' children as their own. Due to the skewed nature of this distribution, we also examined a dichotomous measure (using an approximate median split), comparing those reporting 3+ close ties with children versus those reporting 0–2 such ties in order to evaluate whether the observed association was influenced by the more extreme values. This was not the case: the dichotomous measure indicated that men reporting 3+ close ties with children at baseline reported more than twice as much ADL disability at follow-up ($OR = 2.3$; $p < .05$). Adjustments for baseline sociodemographic and health status covariates reduced this latter finding to only marginal statistical significance although the estimated effect size did not change. The continuous measure for ties with children remained a significant predictor of ADL disability.

Among the women, those reporting more close ties with relatives were less likely to experience onset of new or recurrent ADL disability. There was also a marginally protective association with larger overall network size as well. Only the association with number of close relatives remained marginally significant after adjustment for baseline covariates.

Network support characteristics. — Analyses of our measures of network support characteristics revealed significant effects only among the men. In both the bivariate and multivariate analyses, measures of average and maximum frequency of instrumental support received from the network were posi-

Table 2. Baseline Characteristics by Gender*

	Men ($n = 444$)	Women ($n = 587$)	p -value	Total ($N = 1031$)
Network Structural Characteristics				
Network size	10.7 (5.4)	9.4 (5.1)	.001	10.0 (5.3)
No. close ties with children	2.2 (1.9)	2.0 (1.9)	.04	2.1 (1.9)
No. close relatives	3.9 (3.2)	3.4 (2.9)	.01	3.6 (3.0)
No. close friends	4.7 (3.5)	4.0 (3.0)	.003	4.3 (3.2)
No. visual contacts	8.1 (5.0)	7.4 (4.5)	.01	7.7 (4.8)
Married (% Yes)	71.0%	30.2%	.001	47.5%
Network Functional Characteristics				
Average frequency of instrumental support	1.6 (.7)	1.6 (.8)	.49	1.6 (.8)
Maximum frequency of instrumental support	2.2 (.8)	2.0 (.8)	.001	2.1 (.8)
Average frequency of emotional support	2.4 (.5)	2.5 (.5)	.001	2.5 (.5)
Maximum frequency of emotional support	2.7 (.5)	2.8 (.5)	.08	2.7 (.5)
Average frequency of demands and criticism	.7 (.6)	.6 (.6)	.001	.6 (.6)
Maximum frequency of demands and criticism	1.2 (.8)	.9 (.8)	.001	1.0 (.8)
Covariates				
Age in 1988	74.0 (2.8)	74.4 (2.7)	.04	74.2 (2.7)
Race (% White)	83.3%	79.2%	.10	81.0%
Education (years completed)	10.7 (3.7)	10.6 (3.0)	.63	10.6 (3.3)
Income (% < \$10,000/year)	24.8%	52.3%	.001	40.4%
Systolic blood pressure (mmHg)	137.9 (18.5)	138.0 (20.2)	.91	137.9 (19.5)
Body mass index	26.1 (3.5)	26.0 (4.7)	.92	26.1 (4.2)
Metabolic disease (% Yes)	28.2%	30.5%	.41	29.5%
Disability 1988: (% Yes) (Rosow or Nagi)	21.0%	28.1%	.009	25.0%
Physical performance 1988	2.9 (.4)	2.7 (.5)	.001	2.8 (.5)
Cognitive performance 1988	53.2 (9.7)	53.3 (9.8)	.89	53.2 (9.7)
Depression	1.3 (.3)	1.3 (.3)	.91	1.3 (.3)

*Mean (\pm SD) or Percentage.

tively associated with increased risk of ADL disability (see Table 3). As in the analyses of ties with children, we also examined a dichotomous measure of maximum instrumental support because the distribution was skewed toward higher amounts of support. Again, our concern was that a small number of subjects with more extreme values could be unduly influencing our results. We examined a dichotomous measure which compared those reporting the highest maximum frequency (i.e., those reporting that such support is received “frequently”) versus those reporting that it was received only “sometime, rarely or never” from spouse, children, or friends/relatives. As shown in Table 3, the dichotomous measure of high vs low maximum frequency of instrumental support also yielded a highly significant association: Men reporting more frequent instrumental support were nearly seven times more likely to experience onset of new or recurrent ADL disability (OR = 6.86, $p < .001$).

Multivariate models for average and “maximum” frequency of emotional support, adjusting for baseline sociodemographic and health status covariates, also revealed significant associations with increased risk of ADL disability. Inspection of the bivariate associations between measures of emotional support and covariates revealed that cognitive and physical performance as well as depressive symptomatology each contributed to the “suppression” of the bivariate association between emotional support and ADL disability. Specifically, emotional support was positively associated with better cognitive and physical performance while higher scores on each of these measures were negatively associated with risk of ADL disability. Similarly, greater depressive symptomatology was negatively correlated with emotional support but was positively related to risk of ADL disability. Adjustments for these patterns of joint association revealed a stronger, independent association between emotional support and ADL disability. Neither average nor maximum frequency of perceived demands or criticism were related to

onset of new or recurrent ADL disability in men. For the women, none of the measures of support characteristics was related to onset of ADL disability in any of the models.

Network structure and support (combined multivariable model). — As indicated, a final multivariable model was examined which simultaneously included all of the social network structural and support variables found to be at least marginally significant predictors ($p \leq .10$) in the individual multivariable models for men or women shown in Table 3. This final model included close ties with children, close ties with relatives, maximum frequency of instrumental support, and maximum frequency of emotional support (see Table 4). Among men, the strongest predictor of increased risk of ADL disability continued to be higher maximum frequency of instrumental support. Analyses using the dichotomous measure of maximum instrumental support did not alter this finding (OR = 5.2; 95% C.I. = 1.54–20.44). Inclusion of both instrumental and emotional support in a single model reduced the effect for maximum emotional support to non-significance, indicating that the earlier association (see Table 3) was due to the positive association between emotional and instrumental support ($r = .41$, $p = .0001$). Close ties with children also remained a significant predictor of increased risk of disability. However, this association was reduced to nonsignificance when the dichotomous measure was examined (OR = 1.98; 95% C.I. = 0.81–4.85), suggesting that the observed association with the continuous measure was influenced by the experience of the small number of men reporting very large numbers of such ties (a group too small for more detailed analyses). Among the women, there were again no statistically significant associations. However, ties with close relatives and children had marginal associations with lower risk of ADL disability (see Table 4), and the dichotomous measure of maximum frequency of instrumental support did show a pattern of in-

Table 3. Associations between Social Network Characteristics and Onset ADL Disability; Odds Ratio

	Men (n = 444)		Women (n = 587)	
	Bivariate Models	Multivariate Models*	Bivariate Models	Multivariate Models*
Network Structural Characteristics				
Network size	1.05	1.05	0.92 ⁺	0.93
No. close ties with children	1.29**	1.28**	0.83	0.80
Ties with children (3+ vs 0–2)	2.30*	2.32 ⁺	0.48	0.46
No. close relatives	1.03	1.05	0.83*	0.85 ⁺
No. close friends	0.98	0.97	0.97	0.99
No. visual contacts	1.05	1.04	0.96	0.97
Married (Yes vs No)	1.08	1.46	1.17	1.05
Network Functional Characteristics				
Average frequency of instrumental support	2.11*	2.31**	0.91	0.88
Maximum frequency of instrumental support	5.00**	5.23***	0.95	0.92
Maximum frequency of instrumental support (>2 vs 0–2)	5.31**	6.86**	1.62	1.65
Average frequency of emotional support	1.68	2.47*	0.94	1.07
Maximum frequency of emotional support	1.84	2.94 ⁺	0.96	1.04
Maximum frequency of emotional support (>2 vs 0–2)	1.47	2.34	1.01	1.16
Average frequency of demands and criticism	0.70	0.71	0.98	0.76
Maximum frequency of demands and criticism	0.81	0.85	1.10	0.93

*Multivariate model includes: Age, Systolic BP, BMI, Metabolic Indicator, Rosow/Nagi Indicator, Physical Performance, Total Cognitive, Depression.

⁺ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4. Logistic Regression Model for Onset ADL Disability by Gender

	Men (n = 444)			Women (n = 587)		
	Odds Ratio	95% C.I.		Odds Ratio	95% C.I.	
Age in years	1.09	0.93	1.29	1.16 ⁺	0.99	1.37
Systolic blood pressure (mmHg)	0.97 [*]	0.95	1.00	0.99	0.97	1.01
Body mass index	0.99	0.88	1.11	1.12 ^{**}	1.03	1.23
Metabolic disease (Yes vs No)	0.79	0.28	2.24	2.67 [*]	1.11	6.42
Rosow/Nagi disability (Yes vs No)	2.10	0.78	5.63	1.14	0.45	2.90
Physical performance	0.66	0.23	1.89	1.64	0.60	4.45
Cognitive performance	0.93 ^{**}	0.89	0.99	1.00	0.95	1.05
Depression	4.68 [*]	1.26	17.41	5.46 ^{**}	1.65	18.09
No. close ties with children	1.24 [*]	1.03	1.49	0.76 ⁺	0.55	1.06
No. close relatives	1.05	0.91	1.21	0.83 ⁺	0.69	1.02
Maximum instrumental support	4.72 ^{**}	1.71	13.02	1.04	0.59	1.84
Maximum emotional support	1.45	0.41	5.11	1.28	0.48	3.44

⁺ $p < .10$; ^{*} $p < .05$; ^{**} $p < .01$; ^{***} $p < .001$.

creased ADL disability among women reporting more frequent instrumental support (OR = 2.12; $p = .11$, 95% C.I. = 0.84–5.38), a pattern consistent with the stronger association seen among the men. The apparent gender differences in the associations between ties with children and frequency of instrumental support and risk of ADL disability were tested for statistical significance by including interaction terms for gender with each of these factors in analyses of the combined sample of men and women. These analyses confirmed that the associations were significantly stronger among the men (data available on request).

DISCUSSION

These analyses examined the impact of various social network structural and support characteristics on the 2.5 year risk of onset of new or recurrent ADL disability for a cohort of relatively high functioning older men and women, aged 70–79 at baseline. There were no significant protective effects for either network structural or support characteristics. Close ties with relatives and children did show marginally significant associations with less onset of new or recurrent disability among the women. There was also a marginal effect of close ties with children on risk of onset for the men. This effect indicated increased risk of onset of new or recurrent disability among men reporting more close ties with children. However, in light of the small numbers of events and the number of statistical tests that were undertaken, these findings should be viewed with considerable caution. The effect of close ties with children among the men in particular appeared to be due to a small number of men who reported large numbers of such ties. Further research is needed to confirm the possible importance of various types of ties and possibility of gender differences in relation to risks for onset of new or recurrent ADL disability.

The most salient finding in these analyses was that greater frequency of instrumental support was a significant predictor of *increased* risk of onset of new or recurrent ADL disability. Though this effect was significant only for the men, the data for the women exhibited a parallel trend. At first glance, such an inverse association between higher levels of support and increased risk for onset of new or recurrent disability

might seem counterintuitive, particularly in light of the considerable research reporting on positive effects of social support on health (for reviews see Broadhead et al., 1983; Cohen and Syme, 1985; House, Landis, and Umberson, 1988). However, our findings are consistent with a recent study of ADL disability in a representative cohort of older men and women from the New Haven NIA-EPESE study which also found that greater instrumental support at baseline was associated with increased risk of onset of new or recurrent ADL disability (Moritz, Kasl, and Berkman, 1995). Our finding is also consistent with other longitudinal studies showing negative effects of greater instrumental support from family and/or friends on levels of physical functioning after heart attack (Hyman, 1971; Lewis, 1966) and stroke (Glass and Maddox, 1992; McLeroy et al., 1984).

There are several possible interpretations of our finding that greater “maximum” frequency of instrumental support was associated with significantly increased likelihood of self-reported onset of new or recurrent ADL disability 2.5 years later, particularly among the men. First, more frequent reported instrumental support at baseline may have reflected the early stages of declines in functional ability so that those men reporting more frequent support actually *needed* more help despite their lack of reported disability. These same men may then have experienced further declines over the 2.5 year follow-up, declines that reached the level of actual reporting of ADL disability by the follow-up interview. Our finding that the instrumental support association remained significant, independent not only of baseline health status, but more importantly, independent of actual measured physical performance ability, argues against this interpretation. Our measure of physical performance specifically controls for more minor variations in physical ability that would not be picked up by the measures of disability. As indicated, however, instrumental support remains a significant predictor of reported onset of new or recurrent ADL disability even after controlling for such variations in physical performance abilities.

A second possible interpretation is that the observed association reflects the consequences of greater reliance on others, a behavior pattern which may, over time, erode the

recipient's confidence in their ability to do things independently (Brickman et al., 1982; Coyne, Wortman, and Lehman, 1988; DiMatteo and Hays, 1981). Greater reliance on others may also be associated with greater risk of reductions in actual physical ability, i.e., decreases in "fitness" through disuse (Bortz, 1982). Both of these phenomena (i.e., loss of confidence and loss of actual ability) could result in greater *reported* ADL disability. Indeed, it is worth noting here that the outcome examined in these analyses is a "self-report" of ADL disability and thus reflects both actual inability as well as perceptions of such inability which result in nonperformance of the activity. The idea that receipt of greater instrumental support could lead to reductions in perceived competency to perform various activities is consistent with other research indicating that instrumental (and sometimes emotional) support is not always associated with more positive outcomes and can, in fact, have detrimental consequences for perceived independence, autonomy, and general well-being in older adults (Bowling, 1991; Brickman et al., 1982; Coyne, Wortman, and Lehman, 1988; Krause, 1987, 1990; Lee, 1985; Stewart, 1989). The idea that such reductions in perceived competency could, in turn, lead to declines in actual behavioral performance of these activities (independent of actual underlying physical capacity) is consistent with the extensive literature based on social learning theory demonstrating the importance of perceptions of self-efficacy with respect to the performance of specific behaviors to the actual enactment of such behaviors (Bandura, 1986).

Social learning theory would predict that older adults who come to perceive that they are less efficacious in performing a behavior (perhaps as a result of more frequent instrumental assistance with certain daily activities) will be less likely to engage in such behavior and may indeed come to perceive that they cannot perform this activity (i.e., a form of "learned helplessness"; Seligman, 1975), resulting possibly in increased self-reports of ADL disability. Older adults, such as those in our cohort, may be particularly susceptible to such processes, as cultural norms commonly assume that aging is associated with declines in physical abilities. This may make older adults more susceptible to possible "threats" to self-efficacy beliefs from the socially supportive behaviors of others such as instrumental assistance with household tasks, shopping, and so forth.

The observed gender differences in the strength of the association between instrumental support and onset of new or recurrent ADL disability are interesting as well. This finding is consistent with other data indicating gender differences in the effects of social network and/or support on health outcomes. To date, the most consistent findings are those indicating greater effects of social network characteristics on psychological outcomes for women (for reviews see Antonucci and Akiyama, 1987; Flaherty and Richman, 1989). Parallel to our own findings, a reverse pattern of greater effects among men has been reported with respect to more physical health outcomes (Kaplan and Hartwell, 1987; Seeman et al., 1995) and mortality (House, Landis, and Umberson, 1988; Kaplan et al., 1988).

In our case, one might hypothesize that the stronger effects of instrumental support among the men may reflect a

greater tendency for older men (as compared with older women) to interpret or internalize greater instrumental assistance as an indicator of reduced ability on their part, resulting in greater perceived (and reported) ADL disability. Older men may be more susceptible to such interpretations because of the relatively greater cultural emphasis on male self-reliance and independence, making "receipt of instrumental assistance" at older ages perhaps a particular threat to male self-efficacy beliefs (Maccoby, 1990). Indeed, several studies provide support for the idea that men may tend to react more "negatively" to others' attempts to provide support. In a community-based study of older adults, receipt of instrumental assistance was found to be associated with lower subjective well-being among men but not women (Penning and Strain, 1994). A second study, of patients with rheumatoid arthritis, found that men were more likely than women to report experiencing others' attempts to provide support as problematic (e.g., unwanted, upsetting) (Revenson et al., 1991). Unfortunately, our own data do not provide information on subjects' reactions to or feelings about the instrumental support that was provided; we only have reports of the frequency of such instrumental support. One might speculate, however, that the men were more likely to experience others' attempts to be helpful as threats to their sense of self-efficacy and competency, thereby increasing the likelihood of the men's developing perceptions of incompetence and "disability." Data on patterns of change in self-efficacy beliefs within our cohort are consistent with this proposition, as the largest declines in self-efficacy beliefs were seen for men who reported higher baseline instrumental support and went on to report onset of ADL disability. With only two waves of data, we cannot determine whether the declines in efficacy preceded the perceptions of ADL disability. However, the data are consistent with the hypothesis that these men may have internalized the instrumental "help" they received as a threat to their self-image as a self-efficacious individual, leading to declines in their self-efficacy and increased perceptions of ADL disability. The fact that this pattern of association was seen for the men but not the women is also consistent with research on the influence of significant others on adoption of the "sick role," which also shows that men's illness behavior (e.g., number of reported illnesses, number of doctor visits and number of role reductions) was more influenced by the attitudes of significant others such as their wives than was the case for women (Petroni, 1969). Though a full understanding of such gender differences remains to be elucidated, a growing body of research documents the existence of such differences and underscores the importance of focusing attention on possible gender differences in future research on social networks and health.

Several potential strengths and limitations of the present study should be considered in interpreting the findings reported here. The strengths of this study include the fact that the sample was drawn from population-based cohorts reflecting substantial socioeconomic and racial diversity; the longitudinal design with data on onset of new or recurrent ADL disability for a cohort which represented a relatively high functioning, nondisabled group of men and women at baseline; the rich baseline database covering a range of

possible social and psychological risk factors; and the availability of data on possible sociodemographic and health status confounders as well as controls for actual physical performance abilities. The small number of events (i.e., reports of onset of new or recurrent ADL disability) represents the major limitation of these data. With only 25 events among the men and a similar number among the women, the findings presented here must be viewed with considerable caution and certainly require replication. Also, given that our sample was relatively high functioning at baseline, the question of the generalizability of our findings to subgroups of less well functioning older men and women needs to be addressed.

Despite these cautions, our finding that greater frequency of instrumental support may not be unconditionally beneficial to the recipient is certainly worthy of further examination. The finding strikes an important, cautionary note regarding the potential "down-sides" to social support. Hopefully, this will provide a stimulus to direct greater research attention to both positive and negative consequences to health and functioning of various patterns of social interaction. If more frequent instrumental support does not always convey health benefits, then any efforts to promote better health and functioning will need to find a balance between the positive effects that such support can convey in providing much needed assistance (enabling individuals to function more effectively in their daily lives) (Stoller and Pugliesi, 1991) and the potential for less positive effects if such instrumental support leads to excessive dependency and reliance on others, perhaps as a result of reductions in self-efficacy beliefs regarding one's own ability to perform various activities.

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