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## Social Disengagement and Incident Cognitive Decline in Community-Dwelling Elderly Persons

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**Background:** Social engagement, which is defined as the maintenance of many social connections and a high level of participation in social activities, has been thought to prevent cognitive decline in elderly persons. However, few longitudinal studies of this relation have been done.

**Objective:** To determine the relation between social disengagement and incident cognitive decline in community-dwelling elderly persons.

**Design:** Cohort study.

**Setting:** New Haven, Connecticut.

**Participants:** 2812 noninstitutionalized elderly persons (65 years of age or older) who were interviewed in their homes in 1982, 1985, 1988, and 1994.

**Measurements:** A global social disengagement scale was constructed from the following indicators: presence of a spouse, monthly visual contact with three or more relatives or friends, yearly nonvisual contact with 10 or more relatives or friends, attendance at religious services, group membership, and regular social activities. Cognitive function was assessed with the Short Portable Mental Status Questionnaire. Response to the questionnaire was scored as high, medium, or low. Cognitive decline was defined as a transition to a lower category.

**Results:** Compared with persons who had five or six social ties, those who had no social ties were at increased risk for incident cognitive decline after adjustment for age, initial cognitive performance, sex, ethnicity, education, income, housing type, physical disability, cardiovascular profile, sensory impairment, symptoms of depression, smoking, alcohol use, and level of physical activity. The 3-year odds ratio was 2.24 (95% CI, 1.40 to 3.58;  $P < 0.001$ ), the 6-year odds ratio was 1.91 (CI, 1.14 to 3.18;  $P = 0.01$ ), and the 12-year odds ratio was 2.37 (CI, 1.07 to 4.88;  $P = 0.03$ ).

**Conclusion:** Social disengagement is a risk factor for cognitive impairment among elderly persons.

Social engagement, which is defined as the maintenance of many social connections and a high level of participation in social activities, has been thought to prevent cognitive decline in elderly persons. Associations between a socially engaged lifestyle and higher scores on memory and intelligence tests have been observed among community-dwelling older persons (1–5). Short-term interventions to foster social and intellectual engagement have enhanced cognition among nursing home residents (6) and patients with dementia (7). In animal studies (8), mature rodents exposed to complex social and inanimate environments showed better maze-learning ability than those in sparser surroundings. Social engagement challenges persons to communicate effectively and participate in complex interpersonal exchanges. Besides providing a dynamic environment that requires the mobilization of cognitive faculties, social engagement may also indicate a commitment to community and family and engender a health-promoting sense of purpose and fulfillment. Another putative benefit of social engagement is greater availability of emotional support from relatives and friends. Lack of such support can predict adverse health outcomes (9), but its influence on cognitive decline has not been examined.

Although published findings on cognitive function are suggestive, interpretation of available epidemiologic data is hampered by methodologic and conceptual shortcomings. Most studies are not longitudinal assessments of representative population-based cohorts but cross-sectional observations of volunteers or other special samples. Adjustment for potential confounders, such as education or health status, is often lacking. Finally, although the concept of social engagement is intuitively accessible, it has been difficult to measure this construct. Early stud-

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ies viewed previous favorable socioeconomic or occupational status as synonymous with social engagement in old age (1); this precluded examination of more salient or malleable postretirement behaviors. Recent investigations (10–12), however, have used narrowly defined indicators (for example, marital status or specific recreational activities) to make inferences about the effect of late-life social environments on cognition. Other investigations (5) have used composite activity scales as proxies for social engagement but have not distinguished between activities that demand a high level of externally directed attention and those that do not. Social and solitary pursuits are also rarely disaggregated, although each may affect cognitive function differently.

We determined whether a global measure of social disengagement was associated with incident cognitive impairment in a large cohort of community-dwelling elderly persons followed for 12 years. We acknowledge the potential salutary influence of solitary mental pursuits, but we focused on whether interpersonal connections and activities can prevent cognitive decline. Convincing demonstration of such an association could motivate elderly persons, their families, and their care providers to maintain active relationships. It would also justify continued funding for community-based and institutionally based social programs for elderly persons and the adoption of social policies in which activities of older persons are valued.

## Methods

### Participants

The study sample was drawn from the New Haven, Connecticut, site of the Established Populations for Epidemiologic Studies of the Elderly (EPESE) project, described in detail elsewhere (13). The New Haven cohort is a multistage probability sample of 2812 noninstitutionalized persons 65 years of age or older who were living in New Haven, Connecticut, in 1982.

Samples were drawn from three housing strata: public (income-restricted) housing for elderly persons, private housing for elderly persons, and community housing. Women were randomly subsampled to achieve equal representation of both sexes. The baseline response rate was 82%. Trained lay examiners interviewed members of the cohort at home in 1982, 1985, 1988, and 1994 and by telephone in intervening years. Our study was approved by the institutional review board of Yale University.

### Measurements

#### *Cognitive Function*

Cognitive performance was measured during in-home interviews with the 10-item Short Portable

Mental Status Questionnaire (SPMSQ) (14). (The original item “What is the name of this place?” was changed to “What is your address?” because this seemed more appropriate for community-dwelling persons.) Correct answers received 1 point each. If respondents declined to answer 4 or more items or if answers to 4 or more items were missing, the questionnaire was not scored. Otherwise, a participant’s decision not to answer a question was scored as an incorrect answer and scores on missing items were imputed by assigning the mean score of the nonmissing items. As has been done previously (15–17), scores were divided into three categories: high (a score of 9 or 10), medium (a score of 7 or 8), and low (a score of 0 to 6). The validity of the questionnaire as a cognitive impairment measure has been assessed in a subsample of respondents at another EPESE site. Participants received detailed medical examinations to determine the presence and severity of cognitive impairment. When medium scores on the SPMSQ and the category of mild impairment were excluded, the questionnaire’s sensitivity and specificity in identifying moderate or severe impairment were 85% and 96%, respectively (18).

#### *Social Disengagement*

A comprehensive assessment of social connections and activities was completed during in-home interviews. We examined six indicators of social engagement: presence of a spouse, monthly visual contact with at least three relatives or close friends, yearly nonvisual contact (telephone calls or letters) with at least 10 relatives or close friends, frequent attendance (at least once per month) at religious services, membership in other groups, and regular participation in recreational social activities. The Appendix provides exact questions and coding rules for these indicators.

A composite social disengagement index was constructed from the six indicators. Five to six social ties received a score of 1, three to four social ties received a score of 2, one to two social ties received a score of 3, and no social ties received a score of 4. “Tie” refers to any type of social contact. If scores for more than two indicators were missing, the index was not scored.

#### *Emotional Support*

Perceived availability of emotional support from a social network was assessed with the question, “Can you count on anyone to provide you with emotional support—that is, talking over problems or helping make a difficult decision?” The adequacy of this support was assessed by the question, “Could you have used more emotional support than you received?”

**Table 1. Distribution of Follow-up Status on the Short Portable Mental Status Questionnaire**

Status	Baseline (1982)	3-Year Follow-up (1985)	6-Year Follow-up (1988)	12-Year Follow-up (1994)
	←————— n (%) —————→			
Valid Short Portable Mental Status Questionnaire completed	2754 (97.9)	2030 (72.2)	1447 (51.5)	756 (26.9)
Partial or proxy interview completed	58 (2.1)	136 (4.8)	224 (8.0)	186 (6.6)
Not interviewed	0	156 (5.5)	146 (5.2)	95 (3.4)
Deceased	0	490 (17.4)	995 (35.4)	1775 (63.1)
Total	2812 (100.0)	2812 (100.0)	2812 (100.0)	2812 (100.0)

### Covariates

We selected the following self-reported variables as potential confounders because they had cross-sectional associations with disengagement or impaired cognition among the cohort or because they are established risk factors for Alzheimer disease or vascular dementia (both of which are prevalent causes of progressive cognitive decline in elderly persons) (19, 20). Sociodemographic factors were age, sex, ethnicity (white or nonwhite), education ( $\geq 12$  years or  $< 12$  years), annual income ( $< \$10\,000$ ,  $\geq \$10\,000$ , or not given), and housing. Health status indicators were the presence of physical disability, which was defined as requiring assistance “from another person or special equipment” with at least one activity of daily living (walking across a room, dressing, eating, transferring from bed to chair, bathing, or using the toilet) (21) or limitations in gross mobility (climbing one flight of stairs or walking half a mile) (22); high-risk cardiovascular profile (compared with low risk, where high risk was defined as a measured sitting blood pressure  $> 160/95$  mm Hg or a history of physician-diagnosed stroke, diabetes, or myocardial infarction); visual impairment (difficulty in “reading ordinary newspaper print”); auditory impairment (difficulty in “hearing what a person says without seeing his face if that person talks in a normal voice in a quiet room”); and symptoms of depression (a score  $\geq 16$  on the Center for Epidemiologic Studies Depression Scale [23]). Health-related behaviors were current smoking status, alcohol consumption, and level of physical activity (described in the Appendix).

### Statistical Analysis

Cognitive decline was defined as a transition to a lower SPMSQ category (transition from high to medium or low or transition from medium to low) during a given interval. Respondents with low SPMSQ scores at the beginning of an interval were excluded from consideration during that interval.

Incidence of cognitive decline by initial level of social disengagement was estimated over intervals of three lengths: 3-year intervals (1982 to 1985 and 1985 to 1988), 6-year intervals (1982 to 1988 and 1988 to 1994), and a 12-year interval (1982 to 1994).

Approximately 20% of respondents with low SPMSQ scores in 1982 scored higher in 1985 or 1988 and were therefore included in the 1985 to 1988 or 1988 to 1994 analyses. Polytomous logistic regression was used to estimate the relative risk for cognitive decline or death by level of disengagement, controlling for potential confounders. The three outcomes—maintenance of cognitive function, cognitive decline, and death—were treated as unordered categorical variables. To examine the validity of the assumption of a linear dose-response relation between social disengagement and cognitive decline or death, disengagement was initially coded as a set of indicator variables, each corresponding to 1 point on the composite disengagement index. Inspection of the resulting coefficients suggested that modeling disengagement as an ordered categorical covariate was justified; the addition of quadratic or cubic terms did not substantially improve model fit. Unless otherwise indicated, reported odds ratios and CIs refer to the effect associated with a 1-point increase on the disengagement index. The magnitude of the effect of disengagement was similar for the two 3-year intervals and for the two 6-year intervals; therefore, data from intervals of equal length were combined to achieve maximal power. Values of time-varying covariates were updated at the beginning of each interval; when data were missing, values from the previous interval were substituted. The amount of missing data for each covariate at each follow-up was 3% or less.

Calculations were done by using the statistical package SUDAAN, version 7.11 (Research Triangle Institute, Research Triangle Park, North Carolina) (24). The estimating-equations approach (25) was used to adjust standard errors for the clustering caused by the sampling scheme and repeated measurements. Estimates were weighted to reflect differential sampling, coverage, and response rates in housing and sex strata.

### Results

In 1982, 2754 of the 2812 respondents (98%) had valid SPMSQ scores (Table 1). At the 3-year assess-

ment, 2030 respondents (87% of those who were alive) completed the SPMSQ. After 6 years, 1447 respondents (80% of those who were alive) were retested. At the 12-year assessment, 756 respondents (73% of those who were alive) had valid scores.

At baseline, 2412 persons had high or medium SPMSQ scores and were therefore at risk for cognitive decline. Of these persons, 38% were 75 years of age or older, 63% were women, 60% had less than 12 years of education, 62% had incomes less than \$10 000 per year, 12% did not report income, 17% were nonwhite, 8% lived in public housing for the elderly, 14% lived in private housing for the elderly, 25% were physically disabled, 31% had high-risk cardiovascular profiles, 16% had sensory impairments, 15% were depressed, 45% had abstained from alcohol in the previous month, 72% did not exercise regularly, and 46% reported fewer than three social ties. The percentages for each covariate were significantly higher ( $P < 0.05$ ) among

the 342 respondents who had low SPMSQ scores in 1982. Compared with persons who had three or more ties, persons with two or fewer ties had greater odds of low cognitive performance at baseline (age-adjusted odds ratio, 3.00 [CI, 2.07 to 4.35];  $P < 0.001$ ); this association persisted after adjustment for the above covariates (odds ratio, 2.17 [CI, 1.43 to 3.28];  $P < 0.001$ ).

After adjustment for age and initial SPMSQ category, the baseline level of social disengagement was significantly associated with the probability of cognitive decline at the 3-year, 6-year, and 12-year follow-ups (Table 2). In general, as the number of social ties increased, the likelihood of cognitive decline was further reduced. With the exception of group membership, specific types of social contacts did not exhibit consistent significant associations with cognitive decline over the course of follow-up. A similar pattern of results was observed for the outcome of death. The composite social disengage-

**Table 2. Social Correlates of Cognitive Decline (Transition to a Lower Category) on the Short Portable Mental Status Questionnaire among Respondents with a High or Medium Score on the Questionnaire at Baseline (1982)\***

Baseline Covariate	Baseline (1982)†	3-Year Follow-up (1985)		6-Year Follow-up (1988)		12-Year Follow-up (1994)	
		All Respondents	Respondents with a Valid SPMSQ Score (n = 1832)	All Respondents	Respondents with a Valid SPMSQ Score (n = 1330)	All Respondents	Respondents with a Valid SPMSQ Score (n = 710)
		n (%)	% dead	% with decline	% dead	% with decline	% dead
Total	2412 (100.0)	13.2	24.8	29.1	29.1	55.6	37.6
Social disengagement		‡	§	‡	§	‡	§
0 ties	180 (6.6)	18.6	37.2	35.9	35.5	65.8	51.3
1–2 ties	1009 (39.2)	17.7	28.8	37.0	36.3	63.5	46.0
3–4 ties	997 (43.7)	9.4	23.7	23.0	25.4	49.6	36.0
5–6 ties	217 (10.2)	8.0	9.6	19.7	20.1	43.3	22.1
Currently married		‡					
Yes	940 (43.8)	13.5	21.3	26.6	24.5	51.6	31.2
No	1463 (55.8)	12.9	27.6	31.0	33.1	58.6	43.6
Monthly visual contact with ≥3 relatives or friends							
Yes	1730 (74.7)	11.7	25.8	27.5	27.4	53.6	38.1
No	671 (25.0)	17.3	24.5	33.8	34.1	61.2	36.2
Yearly nonvisual contact with ≥10 relatives or friends			§		§		
Yes	612 (29.0)	11.2	20.3	25.9	22.7	51.0	33.7
No	1786 (70.5)	13.9	26.8	30.2	31.9	57.3	39.9
Attendance at religious services		‡	§	‡		‡	
Yes	1246 (53.0)	9.9	22.3	24.2	28.6	51.7	39.0
No	1146 (46.2)	16.8	28.1	34.5	29.0	59.8	35.8
Group membership		‡	§	‡	§	‡	§
Yes	1107 (43.7)	9.4	21.0	23.3	26.4	49.7	32.0
No	1287 (55.6)	16.0	28.1	33.6	31.3	59.9	44.0
Regular social activities			§	‡		‡	§
Yes	504 (22.2)	8.7	17.8	19.8	22.9	44.2	25.1
No	1890 (77.0)	14.3	26.9	31.5	31.0	58.6	42.8

\* Percentages given are from the weighted data. SPMSQ = Short Portable Mental Status Questionnaire.

† The total number for each covariate may be less than 2412 because of missing values.

‡ Probability of dying compared with the probability of remaining alive differs significantly ( $P < 0.05$ ) over levels of covariate. Significance tests are adjusted for age and initial SPMSQ category.

§ Probability of decline compared with the probability of no decline in respondents with a valid SPMSQ at follow-up differs significantly ( $P < 0.05$ ) over levels of covariate. Significance tests are adjusted for age and initial SPMSQ category.

ment index consistently predicted a higher mortality rate at all follow-ups, but many of the individual social indicators did not.

As expected, older persons were less likely to report multiple social connections, as were those with less education, lower incomes, and worse physical or mental health (Table 3). The observed increases in risk for cognitive decline associated with disengagement may be a function of underlying differences in health factors, economic factors, or other factors that affect a person's ability to maintain multiple social connections in old age. Therefore, we controlled for potential confounders before estimating the relative risk for adverse outcomes associated with social disengagement. In these analyses, disengagement status was measured at the beginning of each interval and intervals of equivalent length were aggregated. Although the magnitude of the observed association between disengagement and cognitive decline or death was somewhat attenuated after adjustment for sociodemographic and health characteristics, elderly persons with fewer types of social contacts remained significantly more likely to decline or to die in any given interval than those with more extensive ties (Table 4). Compared with participants who had five or six social ties, respondents who had no social ties had approximately twice the odds of experiencing cognitive decline by any given follow-up. Odds ratios were 2.24 (CI, 1.40 to 3.58;  $P < 0.001$ ) at the 3-year follow-up, 1.91 (CI, 1.14 to 3.18;  $P = 0.01$ ) at the 6-year follow-up, and 2.37 (CI, 1.07 to 4.88;  $P = 0.03$ ) at the 12-year follow-up.

Socially disengaged respondents (those with  $<3$  types of social contacts) were far less likely than their socially engaged counterparts to report that they could count on someone for emotional support (odds ratio, 0.45 [CI, 0.33 to 0.63];  $P < 0.001$ ). To determine whether lack of such support could partly explain the adverse effect of disengagement on cognitive decline, we further adjusted the multivariate model for availability of emotional support. Including this variable did not appreciably alter the magnitude of the disengagement coefficient (Table 4). Similar results were observed when adequacy of emotional support was taken as the support indicator. Availability and adequacy of emotional support were not associated with subsequent cognitive status (data not shown). Therefore, the detrimental effect of social disengagement does not seem to be caused by lack of emotional support.

We conducted additional analyses to clarify the temporal ordering of disengagement and cognitive decline. First, we tested whether a long-standing history of social disengagement would be more predictive of subsequent cognitive decline than social disengagement of recent origin, as would be ex-

**Table 3. Baseline Correlates of Social Disengagement among 2412 Respondents at Risk for Cognitive Decline**

Baseline Covariate (1982)	Socially Disengaged Respondents, % (0–2 ties)	Age-Adjusted Odds Ratio (95% CI) (0–2 ties compared with $\geq 3$ ties)	P Value
Age			
65–74 y	39.9	1.0	
75–84 y	52.6	1.67 (1.33–2.09)	$<0.001$
$\geq 85$ y	69.6	3.46 (2.28–5.24)	$<0.001$
Sex			
Male	41.2	0.76 (0.62–0.94)	0.01
Female	48.7	1.0	
Education			
$<12$ y	50.5	1.56 (1.27–1.91)	$<0.001$
$\geq 12$ y	38.9	1.0	
Income			
Missing	56.7	2.51 (1.75–3.61)	$<0.001$
$< \$10\,000$	49.9	2.00 (1.54–2.59)	$<0.001$
$\geq \$10\,000$	31.9	1.0	
Ethnicity			
Nonwhite	43.0	0.93 (0.68–1.25)	$>0.2$
White	46.5	1.0	
Housing			
Public elderly	61.3	1.95 (1.52–2.51)	$<0.001$
Private elderly	50.5	1.20 (0.92–1.56)	0.17
Community	43.6	1.0	
Physical disability			
Yes	62.7	2.24 (1.78–2.82)	$<0.001$
No	40.1	1.0	
Sensory impairment			
Yes	60.9	1.82 (1.35–2.46)	$<0.001$
No	43.0	1.0	
Cardiovascular profile			
High risk	52.6	1.50 (1.17–1.93)	0.002
Low risk	43.0	1.0	
Symptoms of depression			
Yes	66.3	2.72 (1.99–3.71)	$<0.001$
No	41.9	1.0	
Current smoker			
Yes	53.5	1.70 (1.30–2.21)	$<0.001$
No	44.1	1.0	
Drank alcohol in the past month			
Yes	53.1	1.65 (1.32–2.06)	$<0.001$
No	40.1	1.0	
Regular physical activity			
Yes	31.7	0.47 (0.36–0.61)	$<0.001$
No	51.1	1.0	

pected if engagement is an independent risk factor for (rather than a prodromal feature of) subclinical decline. In accordance with the etiologic hypothesis, the association between disengagement and cognitive decline was somewhat more pronounced in respondents with a consistent history of disengagement (that is, those who reported few social contacts at two or more points before the interval over which cognitive change was assessed) than in respondents for whom disengagement seemed to be a more recent development (that is, those who reported few contacts at the start of a given interval but not earlier) (Table 5). Next, we examined whether social disengagement would predict cognitive decline among only those respondents with the best initial SPMSQ scores. Disengagement was significantly associated with subsequent decline among respondents whose initial scores were in the highest SPMSQ category. Age-adjusted odds ratios were

**Table 4. Odds Ratios for Cognitive Decline or Death (Compared with Maintenance of Cognitive Function), According to Social Disengagement Status at the Start of the Measured Interval\***

Outcome	3-Year Follow-up (1982–1985, 1985–1988)		6-Year Follow-up (1982–1988, 1988–1994)		12-Year Follow-up (1982–1994)	
	Odds Ratio (95% CI)	P Value	Odds Ratio (95% CI)	P Value	Odds Ratio (95% CI)	P Value
Cognitive decline compared with maintenance of cognitive function						
Model 1: adjusted for age and initial SPMSQ category	1.47 (1.29–1.69)	<0.001	1.46 (1.26–1.68)	<0.001	1.54 (1.22–1.95)	<0.001
Model 2: multivariate model†	1.31 (1.12–1.53)	<0.001	1.24 (1.04–1.47)	0.01	1.33 (1.03–1.72)	0.03
Model 3: model 2 adjusted for availability of emotional support	1.32 (1.13–1.54)	<0.001	1.29 (1.09–1.53)	0.004	1.32 (1.02–1.72)	0.04
Death compared with maintenance of cognitive function						
Model 1: adjusted for age and initial SPMSQ category	1.71 (1.45–2.00)	<0.001	1.60 (1.38–1.86)	<0.001	1.70 (1.41–2.05)	<0.001
Model 2: multivariate model†	1.46 (1.22–1.75)	<0.001	1.34 (1.14–1.57)	<0.001	1.36 (1.11–1.66)	0.003
Model 3: model 2 adjusted for availability of emotional support	1.43 (1.20–1.71)	<0.001	1.35 (1.14–1.59)	<0.001	1.36 (1.11–1.66)	0.003

\* Odds ratios are associated with a 1-point increase on the social disengagement index, which is coded as 1 = 5 to 6 ties (least disengaged), 2 = 3 to 4 ties, 3 = 1 to 2 ties, or 4 = 0 ties (most disengaged). Table 2 provides risks for cognitive decline and death by baseline level of social disengagement. SPMSQ = Short Portable Mental Status Questionnaire.

† Adjusted for age, SPMSQ category at start of interval, sex, ethnicity, education, income, housing, physical disability, sensory impairment, cardiovascular profile, symptoms of depression, smoking status, alcohol use, and regular physical activity.

1.44 (CI, 1.23 to 1.68;  $P < 0.001$ ) at the 3-year follow-up, 1.38 (CI, 1.15 to 1.65;  $P < 0.001$ ) at the 6-year follow-up, and 1.46 (CI, 1.08 to 1.98;  $P = 0.01$ ) at the 12-year follow-up, although this relation was even more marked in respondents with medium SPMSQ scores at the start of follow-up. For these respondents, odds ratios were 1.65 (CI, 1.21 to 2.25;  $P = 0.002$ ) at the 3-year follow-up, 1.79 (CI, 1.34 to 2.39;  $P < 0.001$ ) at the 6-year follow-up, and 1.88 (CI, 1.17 to 3.01;  $P = 0.009$ ) at the 12-year follow-up. In addition, when we further restricted the analysis to persons who had a 6-year history of consistently high cognitive performance before the interval over which cognitive change was assessed, social disengagement still predicted subsequent decline (odds ratio over the 1988–1994 interval, 1.52 [CI, 1.03 to 2.24];  $P = 0.03$ ).

## Discussion

We examined the effect of social disengagement on risk for cognitive decline in a cohort of community-dwelling elderly persons followed for 12 years and found that the higher the level of social disengagement, the greater the likelihood of subsequent decline. The odds of experiencing cognitive decline were approximately twice as great in the most disengaged respondents (those reporting no social ties) than in the most engaged respondents (those with five or more ties). This association remained statistically significant after adjustment for many socio-demographic and health factors.

Unlike the summary disengagement measure, none of the individual scale items were as strongly or consistently predictive of cognitive decline over time. Previous investigations that used composite

indexes of social environments (1, 4) usually detected stronger relations between engagement and cognition than did investigations focusing on narrowly defined social indicators (10–12). These observations suggest that although having multiple social connections and activities may be important in maintaining cognitive competence, no particular type of social contact is essential. Social contacts may have a degree of substitutability with respect to their salutary influence on cognitive outcomes.

Our study has many strengths, including a prospective design with repeated assessments of social disengagement and cognitive status, a large population-based inception cohort, and minimal attrition even after 12 years. However, several limitations must be considered when the results are interpreted. First, we used a brief epidemiologic screening instrument rather than comprehensive clinical evaluation to ascertain cognitive status. The SPMSQ does not have optimal ability to detect mild cognitive deficits (26). Some respondents who seemed cognitively intact at baseline may in reality have been suffering from early-stage dementia. Alzheimer disease has an insidious onset, and initial symptoms usually predate clinical diagnosis by several years (27). Nascent cognitive difficulties are often accompanied by psychiatric disturbances, such as apathy, depression, or anxiety (28), which could lead to social withdrawal. If our disengagement index measures social dysfunction more sensitively than the SPMSQ measures contemporaneous cognitive dysfunction, then social symptoms would be the only ones initially recognized in persons who were experiencing both types of dysfunction. Therefore, we cannot exclude the possibility that social disengagement is a prodromal feature of or a reaction to incipient dementia rather than a true risk factor for

cognitive decline. Nevertheless, support for the etiologic hypothesis can be construed because a long history of social disengagement was as predictive of subsequent decline as (or more predictive than) recent-onset disengagement; in addition, social disengagement predicted decline among those respondents whose cognitive status remained stable for many years before the interval over which cognitive change was assessed. Moreover, an elevated level of depressive symptoms, another common noncognitive manifestation of subclinical dementia, was not associated with subsequent decline among persons in our cohort who had a high score on the SPMSQ (29).

Second, although we used a broad-based assessment of social engagement, we did not examine in detail the nature of these social interactions. Social interactions require varying levels of cognitive effort. At least one previous investigation (4) that classified behaviors as “passive” and “active” on the basis of their implied cognitive demand found that active behaviors exhibited more robust associations with cognition. In our study, even stronger relations might have been observed if we had attempted a more nuanced assessment of the degree of cognitive involvement entailed by specific social interactions. For example, “visual contact with relatives or friends” could vary from participating in lively intellectual debate to watching situation comedies together. Nevertheless, all but the most routine interpersonal exchanges require at least some minimal mobilization of cognitive faculties. To the extent that our disengagement index classified respondents along a continuum of environmental complexity, our findings provide support for the “use it or lose it” hypothesis. This hypothesis postulates that continued mental stimulation staves off cognitive deterioration in old age (30), possibly by maintaining a critical density of neocortical synapses (31).

Other aspects of social engagement may account

for its salutary effect. Our data suggest that greater emotional support from a person’s social network is not responsible for a maintained or decreasing level of cognition. The concept of emotional support does not include the idea of a mutual exchange of resources; persons who receive support are seen or may see themselves in a dependent role, as the passive recipients of others’ goodwill. By contrast, the construct of social engagement implies an active, reciprocal connection between persons and their communities. Commitment to family and friends may be an elderly person’s *raison d’être*, providing a sense of purpose and meaning to life, and may assume particular importance in a society that views its oldest citizens pejoratively (for example, as unproductive or helpless). This feeling of useful connectedness, of responsibility toward others, may underlie observed associations, perhaps through the following pathways. A positive self-image may blunt the perceived stressfulness of potentially anxiety-provoking situations. Maladaptive reactions to stress have been shown to lead to increased glucocorticoid production, which in turn has been implicated in hippocampal damage, resulting in measurable learning and memory decrements (32–34). Greater self-esteem is also associated with better self-care practices (regular exercise and smoking abstinence, for example) (35), which protect against cardiovascular disease, a strong risk factor for dementia (20, 36–38). However, although statistical control for health-related covariates somewhat attenuated the relation between social disengagement and cognitive decline, the association remained strong; this suggests that such behavioral mechanisms only partly account for the beneficial effect of social engagement.

Missing data due to death or nonresponse should also influence interpretation of our results. If disengagement did not predict unobserved decline among respondents who subsequently died or did not par-

**Table 5. Adjusted Odds Ratios for Cognitive Decline (Compared with Maintenance of Cognitive Function) on the Short Portable Mental Status Questionnaire, according to Consistency of Social Disengagement History**

Follow-up	Year(s) in Which Respondents Were Disengaged*	History of Disengagement	Respondents	Decline†	Odds Ratio (95% CI)‡	P Value
			n	%		
3-year (1985–1988)	1982 and 1985	Consistent	374	34.7	1.49 (1.00–2.20)	0.05
		Sporadic, past	135	23.0	1.08 (0.92–1.88)	>0.2
		Sporadic, recent	182	31.3	1.32 (0.79–2.21)	>0.2
		None	550	22.3	1.0	
6-year (1988–1994)	1982 or 1985, and 1988	Consistent	210	44.0	1.87 (1.10–3.18)	0.02
		Sporadic, past	109	35.8	1.68 (0.91–3.12)	0.10
		Sporadic, recent	60	37.8	1.49 (0.71–3.09)	>0.2
		None	251	25.8	1.0	

\* Disengagement index  $\geq 3$  (0 to 2 social ties).

† Estimated from the weighted data.

‡ Odds ratios are estimated from the weighted data and are adjusted for age, Short Portable Mental Status Questionnaire category at the start of the measured interval, sex, ethnicity, education, income, housing, physical disability, sensory impairment, cardiovascular profile, symptoms of depression, smoking status, alcohol use, and regular physical activity.

ticipate in reinterview as well as it predicted decline among those who were retested, our estimates would be biased upward. Several procedures were used to evaluate the effect of this potential bias. When respondents with partial or proxy follow-up interviews were assumed to have declined cognitively or, alternatively, when decline and death were combined into one category, the associations in **Table 4** were minimally affected. In addition, stratification by proximity to death did not reveal a consistently stronger or weaker relation between disengagement and decline among those who retook the SPMSQ at least once but died within 2 years of retesting than it did among those who survived 2 or more years after retesting (data not shown). These findings indicate that selection bias had a negligible effect.

The data from this population-based longitudinal study indicate that social disengagement is significantly associated with incident cognitive decline among cognitively intact community-dwelling elderly persons. Our findings suggest that maintaining many social connections and activities may help to prevent or postpone cognitive deterioration in old age. Large-scale randomized intervention studies are needed to answer this question conclusively. These studies might initially be conducted in such settings as assisted-living facilities or nursing homes, in which the logistics of creating and controlling opportunities for social interaction could more easily be implemented than in the general community. In the meantime, clinicians should alert elderly patients and their caregivers to the potential cognitive benefits of social engagement, and policymakers should support the development of social policies and programs that promote social engagement among older citizens. Innovations could occur in employment, by increasing provisions for delayed retirement, part-time work, flexible hours, and volunteerism; in education, by creating affordable options for late-life learning (for example, Internet training); and in the community, by designing living spaces and by providing services (for example, accessible transportation) that maximize opportunities for social interaction (39, 40).

## Appendix: Social Disengagement Index

### I. Presence of spouse (SPOUSE)

1. Have you ever been married?

(Response codes: 1 = yes, 2 = no [skip Question 2])

2. Are you now married, separated, divorced, or widowed?

(Response codes: 1 = married, 2 = separated, 3 = divorced, 4 = widowed)

If the response to Question 1 = 1 and the response to Question 2 = 1, then code SPOUSE as 1; otherwise, code SPOUSE as 0.

II. Monthly visual contact with three or more relatives and close friends (VISUAL)

III. Yearly nonvisual contact with 10 or more relatives and close friends (NONVIS)

Children:

1. How many children, if any, have you had (including adopted children or children you have raised)? (If none, code Questions 2–4 as 0.)

2. How many are presently living?

3a. How many of your children do you see at least once a week?

3b. Of the others, how many do you see every month?

4a. How many of your children do you talk to on the phone or correspond with weekly?

4b. Of the others, how many do you talk to on the phone or correspond with monthly?

4c. Of the others, how many do you talk to on the phone or correspond with several times a year?

Other relatives:

5. In general, apart from your children, how many other relatives do you have that you feel close to? (People that you feel at ease with, can talk to about private matters, and can call on for help.)

6. How many of these relatives do you see at least once a month?

7. How many of these relatives do you correspond with, either by letter or telephone, a few times a year?

Close friends:

8. In general, how many close friends do you have? (People that you feel at ease with, can talk to about private matters, and can call on for help.)

9. How many of these friends do you see at least once a month?

10. How many of these friends do you exchange letters or telephone calls with a few times a year?

If the response to Questions 3a + 3b + 6 + 9  $\geq$  3, then code VISUAL as 1; otherwise, code VISUAL as 0.

If the response to Questions 4a + 4b + 4c + 7 + 10  $\geq$  10, then code NONVIS as 1; otherwise code NONVIS as 0.

### IV. Frequent attendance at religious services (CHURCH)

1. About how often do you go to religious meetings or services?

(Response codes: 1 = never or almost never; 2 = once or twice a year; 3 = every few months; 4 = once or twice a month; 5 = once a week; 6 = more than once a week.)

If the response to Question 1  $\geq$  4, then code CHURCH as 1; otherwise, code CHURCH as 0.

### V. Membership in other groups (GROUPS)

1. Do you participate in any groups, such as a senior center; social or work group; church-connected group; self-help group; or charity, public service, or community group?

(Response codes: 1 = yes [specify]; 2 = no)

If the response to Question 1 = 1, then code GROUPS as 1; otherwise, code GROUPS as 0.

### VI. Regular participation in recreational social activities (SOCACT)

Here is a list of things people do in their free time. In the last month, how often have you done each of these things?

(Response codes: 0 = never; 1 = sometimes; 2 = often)

1. Active sports or swimming

2. Take walks

3. Work in the garden or yard

4. Do physical exercises

5. Prepare your meals

6. Work at a hobby

7. Go out and do some shopping

8. Go out to a movie, restaurant, or sporting event

9. Read books, magazines, newspapers

10. Watch television

11. Day trips, overnight trips

12. Unpaid community or volunteer work

13. Paid community work

14. Regularly play cards, games, or bingo

15. Any other activities (specify)

Regular participation in recreational social activities:

If the response to Questions 7 + 8 + 11 + 12 + 13 + 14  $\geq$  6 (that is, if the mean response = 1), then code SOCACT as 1; otherwise, code SOCACT as 0.

(Note: It is possible that activities were done alone. Items

were chosen on the basis of the authors' judgment that, more often than not, these activities are done with other people.)

Regular participation in physical activities (not part of the social disengagement index):

If the response to Questions 1 + 2 + 3 + 4  $\geq$  4 (that is, if the mean response = 1), then code PHYSACT as 1; otherwise, code PHYSACT as 0.

A composite index of social disengagement was constructed from the six indicators (SPOUSE, VISUAL, NONVIS, CHURCH, GROUPS, and SOCAT). Scoring was as follows: 1 = five to six ties, 2 = three to four ties, 3 = one to two ties, 4 = no ties. "Tie" refers to the type of social contact. If more than two indicators were missing (questions that were not answered and "don't know" responses were scored as missing), the index was not scored.

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