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Adults With Cardiovascular Disease Who Help Others: A Prospective Study of Health Outcomes

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Abstract

Little is known about the health impact of helping behaviors among individuals with high-risk chronic diseases such as cardiovascular disease (CVD). Using a nationally representative, longitudinal survey, we examined the subsequent health of adults with CVD ($n=4,491$) who spent time providing non-paid assistance to family and friends outside of their households compared with those who had provided no assistance. After both adjusting for baseline characteristics and using propensity score matching methods, spending up to 200 hours over the prior 12 months helping others was associated with lower odds of experiencing a new CVD event or dying in the subsequent two years. Providing up to 100 hours of assistance was associated with reporting fewer depressive symptoms. This threshold effect raises the question of whether assistance beyond a certain number of hours may impose a burden that mitigates health benefits from helping others.

Health care providers could play an important role exploring ways that patients with CVD can provide beneficial levels of assistance to others in their own social networks or communities, thereby possibly also improving their own health.

Keywords

Social support; epidemiology; cardiovascular disease; cohort

“[T]he generous will prosper, and those who refresh others will themselves be refreshed.”

(Proverbs, 11:25)

There is strong epidemiologic evidence that involvement in social relationships is beneficial for health and well-being (House, 2001; House et al., 1988). People in close relationships are happier, healthier (Berkman & Glass, 2000; DiMatteo, 2004) and have a lower mortality risk than those who are socially isolated (Friedmann et al., 2006; Murberg, 2004; Zhang et al., 2007). Receiving social support from others may be especially important for older adults living with chronic illnesses such as cardiovascular disease (CVD). Social support—especially disease-specific support—is associated with better disease self-management (Gallant, 2003; Sayers et al., 2008), whereas the absence of emotional support predicts subsequent cardiovascular events among heart failure (HF) patients (Krumholz et al., 1998). However, other studies have failed to demonstrate health benefits of receiving social support. For example the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) randomized control trial found little benefit from increasing receipt of social support from current support networks on disease-specific outcomes (Berkman et al., 2003). Other observational studies have not found benefits from receiving social support (Ironson & Hayward, 2008; Luttk et al., 2005) with some studies finding harmful effects (Brown et al., 2003; Moran et al., 2008). Thus, receipt of social support may only partially explain the effect of social relationships and may not be a significant contributor to health outcomes for some patients (DiMatteo, 2004; Smith et al., 1994).

A growing body of research suggests that health benefits from helping others may further explain the link between close social relationships and better health (Brown et al., 2008; Brown et al., 2003; Brown et al., In Press; Brown et al., 2005; Liang et al., 2001; Post, 2007; Post, 2005; Schwartz & Sendor, 2000). Individuals who provide social support through volunteering experience less depression, heightened self-esteem and self-efficacy, improved quality of life, and reduced mortality (Krause et al., 1992; Luoh & Herzog, 2002; Musick & Wilson, 2003; Oman, 2007; Van Willigen, 2000; Wheeler et al., 1998), even after adjusting for baseline health and socio-demographic characteristics. Providing practical or emotional support to family members and friends is associated with greater longevity (Brown et al., 2003; Brown et al., In Press), lower morbidity (Brown et al., 2005), and faster recovery from depression after spousal loss (Brown et al., 2008; Brown et al., 2003; Brown et al., 2005). The health benefits of increased supportive behaviors to others may be especially strong among those who are elderly and have fewer opportunities to contribute to others' well-being (Van Willigen, 2000). Many chronically ill older adults have limited social networks and lack opportunities to be of service formerly available through jobs, raising children, or marital relationships.

To date, however, most studies exploring the health effects of extending help to others have focused on relatively healthy populations of adults (Post, 2007). As a consequence, prior efforts have not addressed the key question of whether one has to be healthy in order to glean health benefits from giving. Understanding whether and the ways in which the

provision of support may benefit less well individuals is important, since those populations are most at risk for physical and mental health declines and for the use of costly health services. Moreover, little is known about whether there is a dose-response effect of providing help to others on health: Is provision of more hours of help to others more or less beneficial than providing fewer hours? Is there a point beyond which providing assistance to others may even be detrimental to health? Several recent studies document the significant burdens and consequent adverse health outcomes of long hours of caregiving (Dimsdale, 2008; Fredman et al., 2008). This raises the important question of understanding at what level, if any, providing assistance to others may mitigate potential health benefits from helping behaviors.

To address these deficiencies in knowledge, we sought to extend prior evidence on the health benefits of providing social support to others by examining these associations among older adults with cardiovascular disease (CVD). Through a national, longitudinal survey of adults aged 51 or older with CVD, the present study addressed two research questions: 1) Is spending time helping non-coresident friends, neighbors and relatives associated with subsequent changes in self rated health status (CSRHS), limitations in activity for daily living (ADL), depressive symptoms (CESD score), new cardiovascular events, and death, after adjusting for demographic, socio-economic covariates and baseline health conditions and provision of social support? And 2) Is there a threshold of hours beyond which providing assistance no longer confers health benefits and may even be detrimental to health? We hypothesized that those who report providing assistance would report subsequent better health and cardiovascular outcomes than those who reported providing no assistance. However, we further hypothesized that beyond a certain level of assistance the health benefits would diminish or even be reversed, possibly due to excessive stress and burdens imposed by the assistance requirements.

Methods

Overall Study Population

We examined these questions using de-identified, publicly available data from 4,491 participants with cardiovascular disease (CVD) in 2002 in the Health and Retirement Study (HRS), a biennial longitudinal survey of a nationally representative cohort of U.S. adults, designed to address a broad range of scientific questions about health and the transition to retirement age (<http://hrsonline.isr.umich.edu>) (Soldo et al., 1997). Telephone or in-person interviews with HRS participants are conducted every two years (Juster & Suzman, 1995).

Our sample includes baseline covariates collected in the 2002 survey and the main explanatory variable (provision of social support) and outcome variables collected in subsequent survey years, 2004, 2006 and 2008. 5,272 reported in 2002 having at least one of the following CVD equivalents: prior myocardial infarction, coronary heart disease, angina, congestive heart failure, prior stroke or transient ischemic attack (TIA). 33% out of 5,272 subjects, or 1,754 subjects, had dropped out of the sample by 2008 because of death. After excluding those missing responses, we have complete responses for 4,491 respondents (64%).

Principal Independent Variable: Helping Non-Coresident Friends and Relatives

Since 1998, the HRS surveys have asked whether respondents provide non-paid assistance to non-coresident friends and relatives. Beginning in the 2002 wave, the survey asked, “Altogether, about how many hours did you spend in the past 12 months helping friends, neighbors, or relatives who did not live with you and did not pay you for the help?” For the survey waves beginning in 2004 through 2008, instead of asking actual hours spent helping

friends and relatives, the survey asked “Have you spent any time in the past 12 months helping friends, neighbors, or relatives who did not live with you and did not pay you for the help?” The following question asked, “Altogether, would you say the time amounted to less than 100 hours, more than 100 hours or what?” For those who responded that they spent greater than 100 hours, HRS asked, “Would it be less than 200 hours, more than 200 hours or what?” and for those who responded less than 100 hours, “Would it be less than 50 hours, more than 50 hours or what?” Accordingly, we adhered to the cut-offs used in the question regardless of survey wave to allow all waves of data to be analyzed.

Health Outcomes

Exploiting the longitudinal design of HRS, we were able to construct within-person changes in participants’ health outcomes, general health status and functional limitations.

Death—We created an indicator of death for those who had died after the prior interview based on year and month of death information available in HRS Exit data. An exit interview is conducted with a “proxy informant” for panel members who have died. To the extent possible, proxy informants are knowledgeable about the health, family, and financial situation of the deceased (often the proxy is a widow, widower, or some other family member). The specific question to the informant is: “what was the date on which [respondent name] died?”

New Cardiovascular Event—The HRS asks respondents directly whether they had new or additional MI and congestive heart failure since the prior interview. For stroke, respondents who never had a stroke according to records from the prior interview are asked whether they have had a stroke since the last interview. For respondents who reported they had a stroke in the prior interview, HRS asks whether they have had an additional stroke since the last interview. Based on respondent answers to these questions, we constructed an outcome variable for a new or additional cardiovascular event as an indicator of whether respondents had had heart attack (MI), heart failure and/or stroke since the prior interview two years earlier.

Change in Self-Rated Health Status (CSRHS)—HRS interviewers each wave ask about changes in health since the prior interview two years earlier: *Compared with your health when we talked with you in (month and year) would you say that your health now is much better (1), somewhat better (2), about the same (3), somewhat worse (4), or much worse (5)?* Higher values denote worse health deterioration (Idler & Benyamini, 1997). We used this variable to assess self-reported changes in health status.

Change in Difficulties in Activity for Daily Living (ADLs)—The ADL index ranges from 0 to 5 which includes five items: *Because of a health or memory problem do you have any difficulty with i) bathing, ii) eating, iii) dressing, iv) walking across a room, and v) getting in or out of bed.* We created a variable indicating change in ADL index from the previous interview year ranging from −5 to 5. The ADL baseline score is the sum of five indicators of functional limitations, and hence ranges from 0 to 5. Therefore, change from the previous interview year ranges from −5 to 5. Those numbers in ADL change can be interpreted as the number of additional activities limited. For example, the value −5 means five more activities are limited compared to the previous interview and −2 means two more activities are limited. Few respondents have values lower than −2 (0.6%) and greater than 2 (2.2%). For the final outcome variable for ADLs, therefore, we re-categorized the change in ADL variable to five groups (−5~−2, −1, 0, 1, 2~5).

CESD Score—HRS asks questions assessing respondents' depressive symptoms and derives one index of symptoms, using a score on the validated Center for Epidemiologic Studies Depression (CESD-8) scale (Radloff, 1977; Steffick & Group, 2000). The CESD score is the sum of six “negative” indicators minus two “positive” indicators. The negative indicators measure whether the respondent experienced the following all or most of the time over the week prior to the interview: i) depression, ii) everything is an effort, iii) sleep is restless, iv) felt alone, v) felt sad, and vi) could not get going. The positive indicators measure i) whether the respondent felt happy and ii) enjoyed life, all or most of the time. The CESD index ranges from 0 to 8. A greater value in CESD index means a greater number of depressive symptoms. We collapsed this into a six-category variable (0, 1, 2, 3, 4, 5–8).

Covariates

Because providing assistance to non-household members may be associated with other factors that also decrease respondents' risk for adverse health outcomes, we adjusted for potential confounding using an extensive set of socioeconomic, health status, and health behavioral variables. Baseline socioeconomic covariates included economic status (quartile in terms of poverty ratio to family income) in 2002 (Brown et al., In Press) years of education (<12, 12, >12); age (64 or younger, 65–74, 75 or older); sex; race (white, African American, Other); and whether the respondent reported living alone in 2002 (reported number of other people living in same house as respondent). We included as covariates a broad range of health measures reported in 2002. A co-morbidity index developed by the RAND corporation was included (0–1; 2, 3, 4–8) based on diagnosis of cancer, diabetes, a heart condition, stroke, chronic lung disease, high blood pressure, or arthritis (RAND HRS Data Documentation, Version J, June 2010). We also included baseline self-rated health status (excellent, very good, good, fair, poor) and health-related functional status using respondent counts in 2002 of physical limitations in activities of daily living (0, 1, 2–5), and limitations in instrumental activities of daily living (0, 1, 2, 3–5). CESD index of depressive symptoms measured in 2002 was included (0, 1, 2, 3, 4, 5–8).

Other covariates included health behaviors such as self-reported smoking status, alcohol use (number of drinks per day; 0, 1, 2, 3 or more), and an indicator of whether respondents participated in vigorous physical activity such as sports, heavy housework, or a job that involves physical labor.

Data Analyses

As our primary analyses, we used multivariable logistic regression for dichotomous health outcomes (Death, CV event) and ordered logistic regression for ordered, categorical outcomes (CSRHS, ADLs, CESD) to examine the independent effects of providing different hours of assistance to non-resident friends, neighbors, or family members on our outcomes of interest. For the main analyses, adjusted analyses included demographic variables (gender, age, race/ethnicity), socio-economic (education, poverty ratio, living arrangement), health status (number of comorbidities, self-rated-health status, ADL index, IADL, index, depressive symptoms scale), health behaviors (smoking, physical activity and drinking), and an indicator of providing social support in 2002.

As secondary analyses, we sought to better address the effect of potential confounding by repeating all analyses using propensity score matching (PSM). Using multivariate logistic regression, we obtained propensity scores of whether respondents reported providing non-paid assistance at baseline. We then implemented one-to-one matches based on the ‘nearest neighbor’ method, which selects the first respondent who reported providing assistance to others in 2002 (“assister”) and finds the respondent who reported not providing assistance to

others in 2002 with the closest propensity scores after ordering ‘assisters’ and ‘nonassisters’ randomly. This method provides a statistically rigorous approach of comparing assisters and nonassisters with similar baseline health status and behavior characteristics. As in a randomized controlled trials, any covariates that remained statistically significantly different between the two groups after propensity score matching were included in all analyses (Leuven and Sianesi, 2003; Dehejia and Wahba, 2002). (See Appendix 1 for additional information.)

Figure 1 presents an overview of our study’s analysis structure. To examine the association between providing non-paid assistance (A) and change in health status (B), we use the retrospective question on social support asked in each survey year (2004, 2006, 2008) and self-rated change in health status (SRCHS), change in self-rated health status (CSRHS), change in ADL (CADL) between the survey wave two years prior and that year. To assess the relationship between providing social support (A) and *subsequent* CV events (heart attack, stroke, congestive heart failure) (D), we use the retrospective question on non-paid assistance measured in each survey wave and examine CV events that occurred between that year and the next survey wave two years after that year (for example, whether providing assistance over the prior 12 months in the 2004 wave is associated with having new/ additional cardiovascular events between the 2004 and 2006 surveys). As a result, only responses from two waves (2006 and 2008 wave) for the CV event outcomes are used in the logistic regression. To view the relationship between provision of social support (A) and mental health (B) (i.e., CESD), we use both variables measured in the same survey wave.

Among 4,491 respondents in the baseline analysis sample, 12% of subjects did not have complete values in the baseline covariates mainly because of missing responses in depressive symptoms measured in 2002. Therefore, we used multiple imputations to create 5 replicates of the dataset that replaced missing covariates with imputed values (Carlin et al., 2008). Estimate results are consistent between non-imputed estimates and those calculated from the multiple imputations (i.e., average from 5 imputed datasets) with only marginal differences. Thus odds ratios and predicted probabilities from imputed data are reported for the multivariate analyses whereas the descriptive data reported in Table 1 are non-imputed. Outcome variables are not imputed in any analyses.

In all analyses, we adjusted for the complex sampling design of the surveys and for the person-level analytic weights provided by HRS to obtain correct population estimates. We used sample weights from 2002, so that our baseline sample represents the U.S. population of persons 51 years or older that year. Regression diagnostic procedures yielded no evidence of substantive multi-collinearity, heteroscedasticity, or influential outliers in any of the logistic models. We performed all analyses with STATA 11, using the publicly available HRS data files [<http://hrsonline.isr.umich.edu>].

Results

Forty-eight percent of the eligible respondents with CVD reported spending time in the prior 12 months helping non-coresident friends, neighbors, and relatives. Figure 2 shows the breakdown of reported hours of assistance in each survey wave from 2004–2008. Table 1 presents baseline characteristics of all respondents stratified by whether they reported providing help in the baseline year 2002 versus those who did not (“assisters” vs. “non-assisters”) and baseline characteristics of assisters and non-assisters included in the propensity score matched sub-sample (n=1,352).

Association between Providing Help and Subsequent Health Outcomes

Table 2 presents adjusted odds of death and of a subsequent CVD event according to level of reported assistance in the multivariate regression analyses and propensity score analyses. In both methods, assisters who provided up to 200 hours of assistance over the prior 12 months had significantly lower adjusted odds of death than non-assisters. In multivariate analyses of the whole sample, respondents who reported providing between up to 100 hours of assistance had significantly lower odds of a new CVD event, whereas in the propensity score matched subsample, respondents who provided 50–99 and those who provided 100–199 hours also had significantly lower odds of a CVD event than non-assisters. (Table 2).

Tables 3 and 4 show the adjusted odds of worsening status in the other self-reported health and functional status measures and in depressive symptoms. As these tables show, in analyses with the full sample, respondents who reported providing assistance for all categories of hours were less likely to report worsening health or functional status (Table 3). However, these differences did not achieve statistical significance in the propensity score matched subsample. In the full sample multivariate analyses, respondents who reported having provided up to 200 hours of assistance were less likely to report significant depressive symptoms (OR: 0.86 FOR 1–50 hours, 0.76 for 50–100 hours, 0.80 for 100–200 hours in Table 4). In the propensity score-matched subsample, adjusted odds were statistically significantly lower for respondents reporting up to 100 hours of assistance. (Table 4)

Discussion

In this nationally representative sample of middle aged and older adults with CVD, providing support to non-resident friends, neighbors, and relatives was associated with a range of improved health outcomes compared to providing no assistance. For most of these outcomes, there was a threshold effect at 100 or 200 hours, above which there were no differences in health outcomes between those who provided that level of assistance and those who reported providing no assistance.

Our results extend to adults with CVD prior findings among healthy adults on the potential health benefits of extending assistance to others. These findings are consistent with those of prior studies suggesting that giving support to others provides as much or perhaps more benefit to the giver than to the recipient. C Schwartz et al, for example, found that a peer support intervention for multiple sclerosis patients was more beneficial in improving mental health outcomes for the providers than the recipients of peer support (Schwartz & Sendor, 1999). She and colleagues also found in a national survey of church members that giving help was a more important correlate of subsequent reported mental health than was receiving help, after adjusting for stress levels and psychosocial and demographic factors (Schwartz et al., 2003).

These findings raise intriguing questions about the possible mechanisms by which providing support to others can contribute to improvements in health, and in particular in CVD, outcomes. A number of potential mechanisms are currently under study. First, researchers are examining the potential role of ‘response shift’, i.e., the giver is better able to escape the excessive self-focus that is a common cause of anxiety and depression (Schwartz & Sendor, 1999; Schwartz et al., 2004). Other proposed mediating factors are enhanced social support and positive psychological states. Helping behavior elevates the helper’s mood (Yinon & Landau, 1987), improves relationship satisfaction (Brunstein, 1993), is associated with increased subjective well-being (Schwartz et al., 2003), and relief from negative affective states such as sadness and distress (Cialdini et al., 1997). Improved psychological states and mental health may foster reduced distress-related wear and tear on the body (“allostatic

load”), translating into improved physical health through psychoneuroimmunologic or psychoendocrinologic pathways (McEwen, 1998). In addition, improved psychological states may prevent or reduce maladaptive health behaviors such as poor medication adherence and illicit drug use (Ironson & Hayward, 2008). Moreover, engaging in helping behavior can increase one’s sense of community and thereby enhance well-being by reducing a sense of social isolation. There is a substantial body of research that suggests that social isolation has substantial deleterious health consequences (House et al., 1988). In addition, perceptions that may be associated with helping behavior such as a sense of mattering, purpose, belonging, meaning, and control have all been shown to reduce depression (Baumeister, 1991).

Other researchers have focused on the potential benefits of enhanced stress regulation that can result from extending assistance to others. Helping behavior has been hypothesized to promote the physical health of the helper by acting, in part, as a stress-buffer. Stephanie Brown et al have shown, for example, that increased help given to others after the loss of a spouse (i.e., providing instrumental support to others) predicts accelerated recovery from depressive symptoms during the bereavement period for those who have had a heightened stress response to the bereavement event (Brown et al., 2008). Furthermore, hormones that are causally linked to helping behavior such as oxytocin (Brown & Brown, 2006) decrease hypothalamic-pituitary-adrenal (HPA) (stress) axis activity (Carter, 1998) and play a role in cellular repair and storage of cell nutrients (Heaphy & Dutton, 2008). Stress reduction has been found to improve blood pressure, a key determinant of CVD-specific health outcomes (Lloyd et al., 2005; Surwit et al., 2002; Wiesli et al., 2005). If future work continues to show help-related health benefits, it will be important to determine whether these effects can be partly explained by links with restorative stress regulation. Future research needs to further examine potential health benefits among patients with CVD of providing assistance and to explore whether these findings also apply to adults with other chronic diseases.

These proposed mechanisms for the potentially beneficial health effects of providing assistance also may underpin factors by which there appears to be a ‘threshold’ number of hours beyond which providing assistance provides no additional benefit beyond providing no assistance. A greater number of hours of providing assistance may be associated with excessive burdens and demands, which in turn could work to increase stress and allostatic load. This non-linear relationship raises hypotheses that need to be pursued in future research.

The potential beneficial health effects of providing assistance to others have important implications for clinical efforts to improve the health of adults with CVD and other chronic illnesses. Volunteering and other forms of proactive assistance to others tend to drop off after age 65, at the precise time when their health benefits have been shown to be the most pronounced, and when doctor visits are frequent (Hirschfelder & Reilly, 2007). Because these older adults and patients with chronic diseases such as CVD are often particularly receptive to health advice from their health care providers (Estabrooks et al., 2003), clinicians can play an important role in exploring ways that patients with CVD can provide beneficial assistance to others in their own social networks or communities.

The present study has clear limitations. First, the study relied on correlational (albeit prospective) data. Consequently, we cannot rule out the possibility that our findings are due to unmeasured confounding, and that those individuals who are the healthiest, even within the sub-group of respondents matched by propensity scores to eliminate statistically significant differences in all the survey health measures, are the ones who reported providing non-paid assistance. While propensity score matching (PSM) can help reduce large biases, significant biases may remain. While PSM significantly improves matching of

comparison groups, it cannot match unmeasured contextual variables as matching only controls for observed variables. To address more definitively the causal role of helping others, one would ideally randomize people to giving or receiving help, and then measure the impact on physical and mental health. However, if unmeasured confounding completely explained our findings, it is unlikely we would have found the differential effects between fewer and greater hours of provided assistance on most of our health outcomes. A second limitation is our reliance on self-report measures for both hours of helping others and health outcomes except for death. These self-reported measures are likely to bear measurement errors that increase noise in the estimations.

In conclusion, we found in this nationally representative longitudinal study of adults with CVD at high risk for health declines that providing non-paid assistance up to 100 or 200 hours over the prior year to friends, neighbors, and family outside one's immediate household is associated with beneficial health effects. Health care providers can play an important role exploring ways that patients with CVD can safely provide beneficial levels of assistance to others in their own social networks or communities, thereby also improving their own health status.

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T0 = 2002

For the association between **A** and **B**, between **A** and **C** : T= 2004, 2006, 2008

For the association between **A** and **D** : T= 2004, 2006

Figure 1.
Analysis Overview: Providing Social Support and Health Outcomes among Older Adults with Cardiovascular Disease

Figure 2.
Help non-coresident friends, neighbors, relatives in the past 12 months (Year 2004–2008)

Table 1

Baseline Respondent Characteristics, Stratified by Whether Respondents Reported Providing Assistance to Non-coresident friends, neighbors, or relatives over prior 12 months (Survey year=2002, N=4,490)

	Helped to non-coresident friends, neighbors and relatives for the last 12		p-value
	Not Helped (N=2,179)	Helped (N=2,311)	
	N (%)	N (%)	
Women	1314 (59.0)	1039 (44.1)	<0.001
Age			
<64	477 (23.0)	752 (36.6)	<0.001
65–74	653 (27.6)	869 (33.1)	
>75	1049 (49.5)	690 (30.3)	
White	1603 (80.5)	1950 (88.7)	<0.001
Education			<0.001
<12	899 (37.8)	575 (23.6)	
12	680 (32.6)	801 (34.3)	
>12	600 (29.5)	935 (42.1)	
Living alone	645 (31.4)	529 (24.8)	<0.001
Poverty ratio			<0.001
0–25%	762 (34.9)	540 (22.8)	
25–50%	610 (30.2)	652 (27.5)	
50–75%	434 (21.0)	584 (25.2)	
75–100%	268 (13.9)	519 (24.5)	
Comorbidity index			
0–1	166 (7.4)	247 (11.0)	<0.001
2	431 (20.0)	574 (25.5)	
3	651 (30.1)	761 (33.0)	
4–8	931 (42.6)	729 (30.5)	
Self Rated Health Status			
Excellent	67 (3.3)	94 (4.1)	<0.001
Very Good	271 (13.0)	527 (23.4)	
Good	623 (29.7)	859 (38.3)	
Fair	738 (32.6)	632 (25.5)	
Poor	480 (21.5)	198 (8.8)	
ADL index			
0	1362 (63.5)	1913 (83.4)	<0.001
1	310 (14.3)	228 (9.4)	
2–5	507 (22.2)	170 (7.2)	
IADL index			
0	1381 (63.6)	2004 (87.2)	<0.001
1	301 (14.3)	186 (7.5)	
2	191 (8.6)	63 (2.7)	

	Helped to non-coresident friends, neighbors and relatives for the last 12		
	Not Helped (N=2,179)	Helped (N=2,311)	p-value
	N (%)	N (%)	
3-5	306 (13.5)	58 (2.6)	
CESD			
0	509 (28.6)	885 (41.9)	<0.001
1	377 (20.9)	454 (21.8)	
2	254 (13.0)	262 (12.4)	
3	189 (10.5)	179 (7.6)	
4	140 (7.3)	114 (5.6)	
5-8	373 (19.7)	243 (10.8)	
Smoking Now	240 (11.3)	296 (12.7)	0.24
Vigorous Activity	456 (21.4)	1003 (43.5)	<0.001
ETOH (glasses/day)			<0.001
0	1794 (80.7)	1630 (69.5)	
1	203 (9.9)	333 (14.7)	
2	104 (5.0)	227 (10.4)	
3 or more	78 (4.4)	121 (5.4)	

Table 2

Odd and Predicted Probabilities of Death or New Cardiovascular Event (Multivariate, Logistic Regression)

	Death (N=7,729)	New CVD Event (N=5,272)
<u>Odds Ratio:</u>		
Providing Social Support (between T-1 and T)		
Ref. Not helped		
1 – 50 hours	0.54*** [0.42 0.71]	0.80 [0.64 1.00]
50 – 100 hours	0.30*** [0.20 0.47]	0.66** [0.49 0.88]
100 – 200 hours	0.36*** [0.22 0.58]	0.75 [0.56 1.02]
200 or more	0.24*** [0.11 0.51]	0.84 [0.58 1.22]
<u>Predicted probability (%) of:</u>		
Died or New CV event (between T and T+2)		
0 hours	12.0	23.3
1 – 50 hours	6.9	19.6
50 – 100 hours	4.0	16.7
100 – 200 hours	4.7	18.7
200 or more	3.2	20.4

Note: All models adjust for gender, age, race, education, poverty ratio, living arrangement in 2002, comorbidity, self-rated-health status, adl, iadl, cesd, smoking, physical activity and drinking behavior in 2002, and an indicator of providing social support in 2002.

Table 3

Odds and Predicted Probabilities of Change of Self-Rated Health Status from prior interview (CSRHS), Self-Reported Change in Health Status (SRCHS), and Changes in ADL (Multivariate, Ordered Logistic Regression)

	Worsening CSRHS* (N=10,716)	Worsening SRCHS** (N=10,789)	Decline in ADLs*** (N=10,727)
<u>Odds Ratio:</u>			
Providing Social Support (between T-1 and T)			
Ref. Not helped			
1 – 50 hours	0.87* [0.79 0.97]	0.81*** [0.71 0.91]	0.75***[0.67 0.84]
50 – 100 hours	0.76*** [0.67 0.87]	0.69*** [0.59 0.80]	0.83** [0.73 0.94]
100 – 200 hours	0.82* [0.70 0.96]	0.71*** [0.59 0.84]	0.76*** [0.66 0.88]
200 or more	0.81* [0.67 0.97]	0.79* [0.63 0.98]	0.76** [0.65 0.90]
<u>Predicted probability (%) of:</u>			
Change in Health Outcome			
0 hours	28.0	40.5	8.0
1 – 50 hours	25.3	35.4	6.1
50 – 100 hours	22.9	31.9	6.7
100 – 200 hours	24.2	32.4	6.2
200 or more	23.8	34.8	6.2

Note: All models adjust for gender, age, race, education, poverty ratio, living arrangement in 2002, comorbidity, self-rated-health status, adl, iadl, cesd, smoking, physical activity and drinking behavior in 2002, and an indicator of providing social support in 2002.

Table 4

Odds and Predicted Probabilities of Poor Depressive Symptoms (CESD index) (Multivariate, Ordered Logistic Regression)

Poor Depressive Symptoms* (N=10,019)	
<u>Odds Ratio:</u>	
Providing Social Support (between T-1 and T)	
Ref. Not helped	
1 – 50 hours	0.86* [0.75 0.98]
50 – 100 hours	0.76** [0.65 0.90]
100 – 200 hours	0.80* [0.68 0.95]
200 or more	0.92 [0.75 1.13]
<u>Predicted probability (%) of:</u>	
CESD index: 5 more (in T)	
0 hours	9.8
1 – 50 hours	8.5
50 – 100 hours	7.7
100 – 200 hours	8.0
200 or more	9.1